

RESOURCE RECOVERY OF DOMESTIC SOLID WASTE
USING SOURCE SEPARATION RECYCLING - CASE
STUDY, GLENORCHY, TASMANIA

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ABSTRACT

The industrialized world is facing an increasing problem of solid waste management. Voluntary household source separation recycling of domestic waste items has not had the publicity that centralized, large-scale, capital-intensive systems have had. Rather, source separation recycling projects have been dependent on the efforts and goodwill of individuals, council officers, industries, charitable groups and other environmentally-conscious people in the community.

This research examines the various reasons for the mounting waste problems and the historical attitudes to and practices of waste management. The historical overview provides a perspective of how early mankind viewed domestic waste. In the Middle Ages, waste was either ignored or very casually dealt with on an individual basis until the connection between waste and disease was made in Britain in the early 1800s. The American experience of waste management is contrasted with the Australian experience. The less dense settlements in most Australian cities and towns in the 1800s allowed a freer and more cavalier attitude towards waste disposal, as domestic animals were used to 'recycle' the food scraps. It was not until the local councils in the middle of the 1800s at the insistence of the cities' health officers emphasized the disease and waste connection, that public 'tips' were opened usually at the edge of the towns for public waste disposal. The historical backcloth provides the context for the discussion of the rise of environmentalism and the more recent concern for the natural environment. The recycling ethos arose out of the environmental movement of the 1960s.

The Glenorchy Case Study sought to establish whether or not a weekly, source separation, multi-material (glass, paper, and aluminium cans) recycling project could be viable in the Glenorchy Municipality, on the northern edge of Hobart, Tasmania. The Study measured three neighbourhoods' weekly participation rates over 8 quarters or 2 years. The neighbourhoods selected were of high, medium and low socioeconomic level. The detailed participation rates over 2 years of weekly data and the \$ amounts of recyclables collected were tabulated. A comparison between the 3 test neighbourhoods showed that Neighbourhood A, the highest socioeconomic neighbourhood, had a higher rate of participation and generated a higher \$ value of recyclables.

The use of the questionnaire survey as both a data-gathering method and as a publicity technique proved to be a successful tool in maximizing the use of limited financial resources for the start-up of the recycling project.

The results of the Glenorchy Study showed that 6 out of 10 householders sampled said they attempted to recycle their refillable glass bottles. Only 53% of householders surveyed said they either returned their deposit bottles for redemption or gave

them to a collector. Only 8% of the surveyed households said they discarded their deposit bottles in the normal garbage collection. Overall, almost 8 out of 10 householders said they either recycled or reused their refillable deposit bottles.

Deposit legislation was supported by about 80% of the surveyed households. This suggested that 4 out of 5 householders would be willing to pay more if the option of returning their bottles to a store or collection centre and getting a deposit refund were a possibility.

Only 5% of the sampled householders said they attempted to recycle their aluminium cans. Aluminium cans represented a small percentage of the beverage can market in Tasmania. The Study represents the first waste compositional analysis in Tasmania. A key finding in the waste compositional analysis was that food wastes accounted for over 50% by weight of the waste generated in the test neighbourhoods. The implication is that a potentially useful waste material is not being composted, but is ending up at the landfill.

The economic analysis suggests that recycling is not viable. Economic viability, even in the highest neighbourhood, was not achieved. The shortfall was about \$16.00 per week over the life of the Project. The social and environmental benefits, while less able to be quantified, were significant. The Project employed handicapped workers from the Society of St. Vincent de Paul to collect, sort and transfer the recyclables. This benefitted the community directly by providing employment for the handicapped workers. The other social benefit was the idea of bringing neighbourhoods together with the goal of helping a charitable organization. The short term environmental benefit was that the quantity of waste diverted from the landfill was significant. The longer term environmental benefit was that the residents' awareness of recycling was awakened and sustained as the non-contacted (those residents who were not personally contacted during the questionnaire survey) joined in the Recycling Project.

The Study showed that by focusing on the bulkiest and most lucrative elements in the waste stream, a significant reduction in the volume and weight of the householders' waste could be achieved. At the same time, waste items could be brought back into the reuse/recycle loop. Recommendations are contained in the final chapter of the Study. One of the major recommendations was a unique grants programme designed to help charitable organizations. Another recommendation was to hire a State Recycling Coordinator to help market recyclables and to set up recycling projects in Tasmania. Source separation recycling is not the total answer to the environmental issue of increased waste generation, but it offers one way to attack an ever increasing problem in today's global community.

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STATEMENT

THIS THESIS CONTAINS NO MATERIAL WHICH HAS BEEN SUBMITTED OR ACCEPTED FOR THE AWARD OF ANY OTHER DEGREE OR DIPLOMA IN ANY UNIVERSITY. TO THE BEST OF THE AUTHOR'S KNOWLEDGE AND BELIEF, THE DOCUMENT CONTAINS NO MATERIAL PREVIOUSLY PUBLISHED OR WRITTEN BY ANOTHER PERSON, EXCEPT WHERE DUE REFERENCE IS MADE IN THE TEXT.

A handwritten signature in cursive script, reading "David L. Clouser". The signature is written in black ink and is positioned above the printed name.

DAVID L. CLOUSER

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1 INTRODUCTION

"It all started over nothing, when you come to think of it. There they were, Chilla and Little Tich, sorting their bottles at the garbage dump, minding their own business, doing no one any harm, going the even tenor of their ways, turning an honest dollar, pursuing their chosen career as scavenging labourers (self-styled Garbos for short) employed by the ratepayers of the Foolgarah Shire Council (known in Strine as the Shy Cancel)" (Hardy, 1971).

The Australian novelist, Frank Hardy, began his political satire in the Outcasts of Foolgarah by depicting a scene at the local landfill (tip). In the Frank Hardy world, there are two classes of people - the affluent and the effluent! The affluent class is made up of public servants, politicians, businessmen, and those professionals who would not normally come in contact with the effluent class, which is made up of those people who collect and dispose of society's waste. Hardy depicts the essential dilemma in waste management today. There are few people who really care about where or how their discards are disposed of as long as they personally do not have to get their hands dirty.

The western nations' economies are based on high mass production and consumption. The costs of a high-production, high-consumption pattern for western society are direct and indirect in terms of waste disposal (Altman et al, 1971; Barnes, 1978). The direct costs are the continued costs of equipment, wages, energy, land and rates, and the degradation of the landscape (Baum, 1974; Cronson, 1979; Handler, 1977). The indirect costs are the psychological effects of wasting waste, the potential environmental problems for the future and the rejection of the idea that resources are limited (Young & Blair, 1970).

These costs make the need for an effective resource recovery strategy necessary. (Resource Recovery is defined as the process of reusing, recycling or converting solid waste into another material, product, or energy form.) Source separation recycling is one technique of resource recovery. (Source separation recycling is defined as the process of sorting and recovering components of the waste stream at the household stage before they are mixed with other wastes.)

In Australia, a growing minority, espousing the conservation ethos, has argued strongly that this "waste of waste" should not continue (Pausacker, 1975; Grenard, 1979). The Australian conservationists are in the forefront of the battle to preserve the finite and unique resources of the planet Earth (Pausacker & Andrews, 1983).

Most of the industrialized world is encountering a mounting problem of solid waste (Hudson, 1986; Bronstein, 1987; Funk, 1987). Indeed, as the affluence of a country increases, there is also a marked increase in the quantity of waste products (Stevens, 1986; Hertzberg & Watson, 1984). The challenges ahead are to make more efficient and frugal use of the world's resources so that the next generation's resources are not squandered and to change peoples' attitudes and practices in the way they think about waste (Dubos, 1972; Goldstein, 1970).

Resource recovery is aimed at reusing and recycling waste so that less total energy is used either in the production of a new product or the reuse of an old one (Knight, 1985; Knap, 1985; Patterson, 1979; White, 1983). Pausacker and Andrews put forth the case in Living Better on Less that the individual can reassess their lifestyle so as to make changes in the use of resources "which do not destroy the spirit, but uplifts the soul" (Pausacker & Andrews, 1983).

Earth Day was declared almost 2 decades ago in the interest of improving the environment. Since those exciting days of the early 1970s, many community groups have tried to arouse the sleeping public to the need for an effective and self-sustaining recycling ethos (Selman and Huls, 1981; Schaeffer, 1970; Schaeffer & Brand, 1980; James, 1975; Hertzberg & Watson, 1984).

This Study describes the Glenorchy Recycling Project undertaken by the author in the Municipality of Glenorchy, a northern suburb of Hobart, Tasmania. Hobart is the capital city of Tasmania, with a population of about 170,000 residents. The Glenorchy Recycling Project was a weekly, voluntary, multi-material recycling programme in three test neighbourhoods, a high, middle and low socioeconomic neighbourhood. The Glenorchy Recycling Project sought to help people assess their usage of resources and to encourage positive community attitudes to recycling. The Questionnaire Survey measured these attitudes. Data were collected on the actual practices of householders week by week for almost 2 years. The Project was also an experiment in testing whether or not recycling could be successful despite an apathetic public, no government support, and unsure markets for the recyclables. The Glenorchy Recycling Project attempted to test whether or not the direct and indirect costs cited above could be reduced significantly by means of source separation recycling (Papp, Hecht and Melberth, 1985; Volger, 1983). It was recognized that there is an inherent reluctance on the part of householders to change their behaviour

patterns and start to care and participate in recycling on a personal basis. However, despite this reluctance, the Project was designed to encourage the residents to participate in the first systematic recycling scheme in Hobart.

The Glenorchy Recycling Study is used to define the entire research which includes the Recycling Project. The Study includes a description of the history of waste and attitudes to waste and disposal and the rise of environmentalism. The Study's process included a literature search on recycling, a sponsored field trip to the Australian mainland, the questionnaire survey and publicity programme, the waste compositional analysis, the selection of the charitable agent to collect the recyclables, and the actual collection and the marketing of the recyclables. The source separation recycling results are discussed in Chapter 7. The summary, conclusions and recommendations are contained in the Chapter 8.

1.1 AIMS OF THE STUDY

The overall aim of the Study was to examine whether or not a weekly, multi-material, source separation recycling project could be economically viable in three test neighbourhoods in Glenorchy, Tasmania.

The specific objectives of this work were:

- (1) to investigate the possibility of involving a charitable organization in a recycling project of this kind;
- (2) to examine the role of the community's awareness of recycling;
- (3) to test the importance of the publicity methods in the success or otherwise of the Project;
- (4) to establish an information base for further work on recycling in Tasmania with emphasis on the economic, social and environmental aspects; and
- (5) to prepare recommendations in light of the experience gained from the Study.

In conducting the Glenorchy Recycling Study, the author was aware of the need to integrate academic concerns with the practical necessity of getting the project up and running. This Project broke new ground in several ways. The innovative aspects of the Project included: the questionnaire survey which also served as a publicity device; the waste compositional analysis, the only one done in Tasmania; the gathering of household participation data; and the involvement of the handicapped. The Project should be seen as a balance between the practical need to get a 'live' project up and running and the academic need for

getting data to confirm or reject the stated concepts about recycling.

1.2 OBSTACLES TO THE STUDY

1.2.1 Need for a Practical Demonstration of Source Separation Recycling in Tasmania

The 1970s was a period when many environmentally concerned individuals and groups wanted to show that it was possible to implement and operate a recycling scheme successfully (Morris, 1982; Savas, 1977; Savas, 1979; Scaramelli, 1979; Miller, 1980; Tichenor, 1978;). However, many of the same groups took an uncompromising or unrealistic position. They attempted to pursue a scheme with little planning. They often rejected the involvement of the business community because they saw business as only interested in profit and not interested in seeking to improve the environment (Perl, 1976; Ministry For Conservation, 1980).

The Glenorchy Recycling Project was premised on the need to be modest in concept, while utilizing the existing networks of collectors, purchasers and business advisors. The Glenorchy Recycling Project had an overall plan, using a step-by-step process in which the scope of the Project could either be enlarged or reduced depending on the capacity of the collector and the sale of the recyclables (Rifer, 1986; Scaramelli, 1979; Schwab, 1986).

The tension academically between the need to set up a project versus the need to view the project objectively challenged the author. Unlike working in a laboratory situation where it is possible to control the variables of the experiment, community based projects do not operate so neatly. The author decided the proper balance was achieved by backing off from the management decisions of St. Vincent de Paul once the Project was up and going. The Glenorchy Recycling Project from the start was intended to be on-going and self-sustaining.

1.2.2 Need to Provide Work Experience for Handicapped Employees

The Glenorchy Recycling Project was initiated in 1981, the International Year of the Handicapped. It was the author's intention from his experience working in low income areas and his involvement with charitable groups dealing with job creation schemes (Scripture Union's Master's Work Force) to help create an activity for handicapped workers (Jefferies & Raftopoulos, 1983; Ontario Association For Mentally Retarded, 1982). The Glenorchy Recycling Project was intended to serve a dual purpose of providing employment for otherwise unoccupied persons and at the same time enable them to work at their pace and style, either with someone or alone on a project that was useful, exciting and challenging (Hall, 1981). Each collection run was like a new game

because one didn't know which household was going to participate or whether one would get a full truck load or 3/4ths of a load of recyclables (Tichenor, 1980). The author also gave the workers encouragement by taking their photographs, putting up charts showing the three neighbourhoods' participation rates over time and by frequent visits to the depot.

As with most work, the initial enthusiasm and excitement of the Project waned somewhat after several months of picking up, sorting, packing returnable bottles, breaking non-returnable bottles, crushing aluminium cans, and baling the paper waste. Part of this waning of enthusiasm was due to changes in the St. Vincent de Paul's management and partly due to staff turnover during the course of the Project. It also became evident that some form of continued supervision was necessary to keep the workers working at a moderate pace (De Young, 1984).

1.2.3 Desirability of Using a Private, Charitable Agency as Collector and Processor of Recyclables

Unlike many recycling schemes in Australia, the Glenorchy Recycling Project was not a council-initiated project (Connolly, 1979). (Councils are the elected body which governs the local municipality. Local municipality equates with local government). This decision was arrived at after conversations with Council officers and with several private collectors. The Glenorchy Council saw the Project simply as one more attempt at recycling which probably would not last. The private collector, St. Vincent de Paul, was much more enthusiastic and made a positive decision to be the agent for the recycling project. Furthermore, St. Vincent de Paul has had a favorable image in the community. (See Plate 1-1) People gained a sense of helping a charitable group as the householders participated in the Project. The Council could not achieve such a favourable image because people tend to see councils primarily as collectors of rates (taxes). Also St. Vincent de Paul had the facility (Hull Street Warehouse) to separate and store the recyclables, plus the vehicle to collect the recyclables.

1.2.4 Need to Generate Support for The Project

The Glenorchy Recycling Project was carried out without any federal, state or local government monies. The author wrote letters to most of the large companies involved in either producing packaging products which end up on a regular basis in the waste stream and/or those companies involved in some phase of recycling and reuse of waste materials asking for monetary support. Several companies such as Australian Consolidated Industries (A.C.I.), Australian Paper Manufacturers, (A.P.M.), Cascade Bottling Company (fillers of bottles) and Broken Hill Pty. Ltd., (B.H.P.)(steel can manufacturers) did contribute to the Project.

The next chapter describes the historical developments in waste management. The historical overview is important to gain a sound understanding of today's environmental problems and initiatives.



Plate 1-1

St. Vincent de Paul Recycling Depot

2 BACKGROUND

2.1 HISTORICAL OVERVIEW: ATTITUDES TO AND PRACTICES OF WASTE MANAGEMENT

Domestic wastes have posed problems for most societies. The Biblical mandate, found in Deuteronomy of the Mosaic Laws, instructed the people to bury their human and animal excrement in order to restore the nutrients to the soil and at the same time prevent diseases. The Hebrews are remembered for their dietary laws and their attention to cleanliness, both of a public and private nature.

The Hebrew practices contrasted with other early societies. For example, the Sumerians saw waste as a curse from the gods. In a Sumerian poem, written about 1000 BC, entitled the "Curse of Ereshtigal, Lady of the Underworld," a vivid picture of urban waste is painted with its association with the curse.

"...the food of the City's gutters
shall be thy food; the sewers of
the city shall be thy drink" (Lampe, 1968).

Gutters contained the litter of the day and the open sewers contained the effluent. The poem reveals the idea that waste was regarded as a curse and was a symbol of the ultimate decay of the city. These waste problems did not deter the building of cities, but the associated stench and filth of the waste did make every day life less than pleasant for urban dwellers.

The early nomadic peoples of the Middle East, who did not live in the cities, but traded with the city dwellers, created large waste mounds of their own. Such mounds occurred around the city of Jericho, one of the oldest of human settlements. Donovan A. Courville states:

"...the large amount of debris interpreted as evidence of occupation of nomads over a period of several hundred years should be interpreted to reflect occupation by a very dense population for a relatively short period of time. Evidently, the mound proper and the ditch referred to were used as dumping grounds by this large, but temporary encampment" (Courville, 1971).

This reference gives insight into what nomadic people did with their household wastes during the migrations to and from the land of Palestine. It is important to note that the mound site (garbage dump) was considered cursed. No dwellings were permitted near the mound site (Courville, 1971).

The folk lore of the early Greeks tells the story of Hercules cleaning out the Aegean stables by diverting a river. What we aren't told is where the effluent went. One can hope that it went back onto the fields and returned to what Homer called the "orderly rhythms of nature's all nourishing earth" (Pavoni, Herr, and Hegerty, 1975).

In ancient Troy, residents dropped their refuse on the floor of their living quarters and allowed it to pile up. When it reached sufficient height that the doors could not open, the doors were repositioned. Later the concept of the open dump came into usage. In Troy, this was a major step in making waste a public issue (National Centre for Resource Recovery, 1974).

The public issue of waste disposal was important in Rome. Burke cites that in early Rome, citizens were required to take their garbage to the edge of town or face a fine. Many streets in Rome were sewered, unlike those of early Greek towns. However, Rome was not noted for its clean streets in many areas of the city (Burke, 1971).

Arthur C. Custance credits the Hametic peoples (early descendants of Ham) with the development of sewage disposal systems on a wide scale. However, this practice appears to have been forgotten by the Europeans in the Middle Ages (Custance, 1975). Urban dwellers often simply disposed of their household wastes by throwing them on the muddy streets and waiting for the scavengers and/or rains to move the waste along. In Towns in the Making, Burke states that "refuse collection was spasmodic and refuse disposal concentrated in a few foul muck hills". Jean Battista Alberti wrote in 1449 that:

"Siena, a city in Tuscany not having drains, wants a very great help to cleanliness; by which means the town not only stinks every night and morning, when people throw their nastiness out the windows, but even in the day time it is seen lying about the streets" (Burke, 1971).

In England, despite the English Parliament in 1388 forbidding citizens to throw garbage into the waterways, the citizens were not deterred from discarding their garbage from their windows to the streets below.

As cities developed from villages and hamlets, waste disposal became an increasingly menacing problem. The sight and sounds of housewives dumping their waste basins onto the streets was a regular daily practice. For the urban dweller, the Biblical instruction of burying their waste outside the camp was lost. The account of the horrific plagues which swept Europe and England during the Middle Ages are well documented (Curl, 1970). The connection between waste and disease apparently was lost.

Later during the 19th Century in the British industrial towns, new urban developments mushroomed as factories began to replace cottage industries. The new industrial factories located near coal and water power. The processing tended to produce waste on a scale that most medieval settlements could not have envisaged.

Sir Edwin Chadwick (1800-1890) made a careful study of living conditions in towns all over Britain. In 1842, he published a General Report on the Sanitary Conditions of the Labouring Population of Great Britain (Read, 1979). He wrote that "refuse was a conglomeration of every kind of filth from houses and factories and streets. Much of it was rotting and putrid because it was ignored or else heaped up to be later sold to farmers" (Read, 1979).

The collection of refuse in the wealthier parts of British towns was done by private contractors. They were called 'night men', because their main task was the removal of night soil. Chadwick promoted street cleansing by a sweeping machine, horse drawn. The brushes pushed the dirt to the side of the road where it was shovelled by hand. The public authorities began their involvement in the removal of refuse in the 1850s. However, it wasn't until the Public Health Act of 1875 that refuse removal became compulsory in Britain. Refuse was stored in ashpits which were described as a "brick or slate container furnished with proper doors and coverings as not to exceed 6 cubic feet in capacity." In the late 19th Century, the bell or signal system was in the vogue in Britain. The cart had a bell attached to it. The carter would blow a trumpet or call "Dust Oh." The householder would then bring out their rubbish (Read, 1979).

The first book on public cleansing was a tiny volume called Dirty Dustbins and Sloppy Streets (Read, 1979). The author, H. Percy Boulnois, a civil engineer and surveyor for Exeter in 1881, said that ashpits should be replaced by a "portable dustbox." He thought the ideal method of collecting refuse was house-to-house. Boulnois felt the drawback was the "expense, delay and difficulty in calling at every house throughout a town" (Read, 1979). This drawback sounds familiar as similar complaints have been written about house to house collections in the 1980s' recycling reports.

Despite Boulnois' pessimism on house-to-house collecting, this method was adopted in British towns in the 1880s. The old carts were replaced gradually by four-wheeled covered side-loading vehicles. However, the horse-drawn carts were a common sight well into the 1930s (Read, 1979).

Chadwick's Report on the Sanitary Conditions of Labouring Population was responsible for the Public Health Act, 1848. The Public Health Act of 1848 brought in requirements on sewage disposal, refuse collection and disposal. This Act helped control

cholera and other diseases. It also marked a turning point for urban settlements. A correlation between disease and proper disposal of waste was established. Of course, to actually implement the laws was quite another thing. The English Parliament attempted to outlaw back-to-back houses in 1840. Creese quotes from Chadwick and describes the back-to-back houses:

"...where it is difficult to get air at all, and impossible to get it untainted by chimneys and sewers; where the refuse of a thickly populated district lies rotting on the open streets, and the gutters do duty for more than surface drainage" (Creese, 1966).

J. Hole of Leeds, another writer of the 1860s, offered a similar view of city life as lived in back-to-back houses:

"...the objection to back-to-back houses exists more specially in towns, where, on account of the limited space, each house cannot have its own conveniences, without either obtruding a nuisance on the public street, or using water-closets, a wasteful way of disposing of valuable material" (Hole, 1866).

J. Hole saw the potential of domestic waste as a "valuable material." This was a significant departure from the norm of urban reformers and critics of the unsanitary conditions. They didn't see the potential value of the "waste," but viewed it as simply something to dispose of quickly and efficiently. For Hole, waste was no longer a curse, but potentially a useful material. This was the start of the modern recycling movement. The whole conservation movement is in debt to the man who tried to keep waste out of the hole.

Another picture of the squalor of the Victorian English towns is in Baker's Report on Leeds.

"...the inhabitants threw refuse and ashe into the street, which sent up a black and irritating dust or left the surface soft and spongy in wet weather" (Creese, 1966).

The history of Europe and Great Britain shows us that waste from domestic dwellings remained a serious health problem and nuisance well into the 19th Century (Creese, 1966).

In America and Australia, urban settlements experienced waste problems. They were dealt with differently. Martin V. Melosi, in his definitive book entitled Garbage in the Cities, Refuse Reform and the Environment, 1880-1980, suggests that for most of the 19th Century, urban America, because of its open

spaces, was more fortunate than Europe and England in dealing with urban waste.

"In the American colonies the abundance of land and natural resources such as water supplies mitigated against massive sanitation problems even in cities and towns" (Melosi, 1981).

However, with the late 19th Century surge of large scale industrialization and urbanization, the urban dweller in America was confronted with

"...heaps of garbage, rubbish, and manure cluttered alleys and streets, putrefied in open dumps, which tainted the watercourses into which refuse was thrown" (Melosi, 1981).

Horses, the major means of individual and group transport, contributed significantly to the waste problem in urban areas. The buildup of organic waste led to the environmental sanitation movement which saw waste as causing many of the contagious diseases. Hence, municipal cleanliness began to be the watchword for many urbanites. Public health officers and sanitarians dominated the thinking about collection and disposal practices in the USA during 1880s and 1890s. Refuse had moved from being merely a nuisance to being the culprit of numerous diseases (Melosi, 1981).

Unfortunately in the rush to rid the urban streets of refuse, many cities took up the practice of dumping into "...lakes, rivers, harbours, and the open sea" (Melosi, 1981).

By 1880, gone were the herds of swine used as urban scavengers. However, this did not solve the problem of dirty streets. About 84% of the cities surveyed in the USA relied on hand sweeping to keep streets clean (Melosi, 1981).

Public awareness began to evolve into public responsibility around the end of the 19th Century. Colonel George E. Waring was appointed Street Cleaning Commissioner of New York City in 1895 ushering in the first practical system of refuse management in the USA (Melosi, 1981).

In 1959, Paul R. Screvane, the Chairman of the Street Sanitation Committee of the American Public Works Association, wrote a book called Street Cleaning Practice (Screvane, 1959). He cited the problems of litter in urban streets and of the need to have municipal household waste collectors cooperate with street cleaners to keep the city clean. The book called for the abandonment of the scavenging practice which was prevalent at the time. The main concern was for efficiency, cleanliness and cheapness. Recycling was not in vogue (Flintoff and Millard, 1969).

Another book by the Refuse Collecting Committee of the American Public Works Association, 1958, called Refuse Collection Practice, describes in great detail the practices, techniques and administrative problems of refuse collection. There was no mention of recycling as an ideal, but there was concern expressed about scavengers (Schneider, 1985). It is significant that it took another 10 years or so before recycling became an accepted concept, even though much informal recycling was taking place in the form of shoe repairs, milk bottles being returned to the fillers and the farmer using animal waste for pasture enrichment. The engineer's quest for efficiency of waste disposal and the sanitarian's quest for health improvement combined to make the sanitary engineer's role an important one in 20th Century America.

Earth Day, 1970, was a symbol of an emerging decade of environmentalism. The ecology and conservation movement grew out of this cauldron and helped generate the new environmentalism of the 1970s. The Clean Water Act, the Water Pollution Control Act of 1972, the Endangered Species Act of 1973, and the Resource Conservation and Recovery Act in 1976 institutionalized the ecology movement (Baum, 1974; Mantell, 1975; Conn, 1978; DeBell, 1970; Denny, 1971). The theme of recycling in one sense is new because of the attitude of trying to avoid contact with waste (O'Grady, 1978). The idea persists that those who deal in garbage, waste and refuse are the 'untouchables' in an essentially antiseptic society where cleanliness is highly prized. The successful recycler has had to overcome this negative image before recycling could take off in the 1970s.

In Australia, a vivid picture of the Melbourne waste/rubbish problem is painted by Bernard Bennett in his book called the Inner Suburbs. He cites the doctor R. T. Tracy, Fitzroy's municipal health officer, as having pointed out in 1864 that only an epidemic would arouse the attention of the authorities to the health problem of inadequate drainage of the sewage in the streets. Dr. Tracy stated that:

"...large disused brick holes filled with stagnant water and used as rubbish dumps"
... were a public health hazard (Bennett, 1971).

The usual method for tackling the waste problem was to throw the rubbish into the back yards to be eaten, trodden or sifted by domestic animals - dogs, poultry, goats, cows and pigs. Pigs were popular because they got rid of the swill and produced meat. Butcher shops, hotels and lodging houses kept pigs for these dual reasons. Refuse not consumed by animals (such as ashes, animal manure, carcasses and junk), accumulated in back yards until the householder could dump it into the street channels, back lanes, vacant blocks, or swamps. However, in the 1860s, the Central Board of Health reminded local councils that

keeping pigs near dwellings was prohibited by the Public Health Act. Thus, alternative disposal techniques were required.

In the late 1850s, Alexander Smith advocated that a garbage receptacle should replace the need to dump wastes promiscuously. In 1864, Fitzroy became one of the first municipalities in Australia to establish a municipal garbage collection service. North Melbourne followed suit. However, many Australian towns waited for another decade. Brisbane, for example, first introduced a collection service in 1875 (Bennett, 1971).

R. J. Solomon's book, entitled Urbanization - the Evolution of an Australian Capital, describes the sanitation problems of Hobart. In 1899 the Officer of Health in his annual report was amazed at how little notice was given to the Bye-Law of 1855 which in theory protected the Hobart Rivulet from becoming a receptacle for filth and rubbish (Solomon, 1976).

The common disregard for sanitation was evident in most towns and cities. One saving grace in Australia was the large allotments and the spread-out nature of many early settlements. This tended to lessen the potential impact of minimal sanitation.

2.2 FACTORS INFLUENCING WASTE GENERATION AND DISPOSAL

2.2.1 Degradation of Products and Materials

The conserver philosophy calls for the encouragement of recycling in the hope of slowing down this process of degradation by adding 'human know-how' and 'energy' before the product or material is rendered into complete disorder. e.g., tipped, burned or littered (Boyd, 1982; Robinson, 1975; Morris, 1976).

The two options available to reduce the effect of degradation are to design the product for longer life if possible (Jupe, 1984), or to design the product with greater potential for recyclability (Brunetti, 1987; Butlin, 1977; Harris, 1982). The first option is preferred because it emphasizes the long term goal of using less total energy. The second option is acceptable, but usually requires a more complex organization and more total energy to implement (Jackson, 1968).

2.2.2 Increased Affluence

The western industrialized countries experienced a surge of affluence after World War II due to economic expansion. This was a period of optimism and consumption. Phrases like 'planned obsolescence' and 'mass production' described this new surge in society's production and consumption patterns. Vance Packard in 1957 described this wave of consumer trends and advertising manipulations in his popular book The Hidden Persuaders (Packard, 1957). This growth in affluence contributed to the increase in

complexity of waste management (Nankin, 1982; Prosser, 1981). It became cheaper to buy a new pair of shoes than to repair an old pair. The tension in human beings between the desire to obtain a new product versus the need to make good use of an old product has been around for most of the human saga. Shakespeare noted that "Fashion weares out more clothes than the man" (Shakespeare, 1985).

2.2.3 Increased Complexity of the Solid Waste Stream

Another aspect of waste generation is the householder's ability to deal with complexity. Recent investigations by sociologists in the USA into disposal habits and attitudes of householders found that because of the increasing magnitude and complexity of solid waste generation, collection and disposal, Americans looked more and more towards the 'painless option' of high technology to solve the waste problem (Schwegler & Hickman, 1981). The American's love of technology and gadgetry has compounded the problem of finding energy-efficient solutions. Bealer, Martin and Crider claimed that householders are overwhelmed by the complexity of the solid waste bulk. It tends to paralyze the householder into acting expediently rather than thoughtfully. The householders simply want to rid themselves of the bulk of waste as fast as possible, rather than separating it into reuseable components. The solid waste stream is such a mix of plastic, amalgamated materials from manufactured products, and other exotic goods that hand sorting of wastes represents neither a significant way of waste reduction or anything more than cosmetic recycling according to some researchers (Bealer, Martin and Crider 1982; Testin, 1971; Berger, 1985).

2.2.4 Unaccounted for Waste

The sheer volume of waste is staggering, but volume is only half of the story. Another dimension of the problem is that of the 250 million tonnes of residential and commercial solid waste produced in the USA in 1969, only 190 million tonnes were accounted for through the collection system. The remaining 60 million tonnes may have ended up in backyards, incinerators, vacant lots, roadside dumps and in similar hit-and-miss sites (Schmalz, 1985; National Centre for Resource Recovery, 1974). This incomplete accounting for waste generation and disposal added a new dimension to waste management as the USA's population became more urbanized. The unaccounted for waste means that indiscriminate dumping would despoil the urban and rural environs and create potential health hazards. This problem may not have been a major concern in the USA's early history with a dispersed population; however, with the concentration of people today, a gap of this magnitude must be viewed with concern. Australia, with its highly urbanized society, must be concerned with unaccounted-for waste also (Schaller & Wallwork, 1979; Knight, 1983).

2.2.5 Attitudes to Waste

Solid waste problems are not only the sheer volume generated or even the missing lump of unaccounted for waste, but it is also people's apathetic attitude and lack of involvement which cause concern for policymakers (Wilkinson, 1980). William Shields, Jr., Director of the Division of Solid Waste of Maryland's Department of Health, has stated:

"The problem of solid waste management is divided roughly in the proportion of 10 per cent technical and 90 per cent people" (National Centre for Resource Recovery Inc., 1974).

Despite the obvious need to increase people's awareness and commitment to solving the waste problem, Bealer, Martin and Crider found that the empirical data and social science research into solid waste management were limited (Bealer, Martin and Crider, 1982).

Several authors have written on social aspects of waste. Robert Hughes, noted Australian writer and art critic, states in his book Shock of the New that "...the landscape of waste is the language of junk because societies reveal themselves in what they throw away." Hughes goes on to ask the question "why should a work of art not be a dip into vast unconscious middenheaps that the city secretes every day? Street junk was to these artists what the flea market had been to the Surrealists" (Hughes, 1980). Hughes suggests that garbage is important as a measurement of society's values and that it could be a new art form in its own right.

Michael Thompson adds to the discussion of waste as a social reality in discussing the creation and destruction of value in his book Rubbish Theory. He states that "...in order to study the social control of value, we have to study rubbish." Thompson purports that rubbish is socially defined (Thompson, 1978).

One of the first people to take rubbish seriously as a way of studying modern lifestyles and habits was William Rathje, professor at the University of Arizona at Tucson. One tentative conclusion from his work is that the middle class is more wasteful than either the rich or poor (Schmitt, 1981). This appears to challenge the long held view of the frugal middle class (Rathje et al, 1985; Rathje and Ritenbaugh, 1984; Stump, 1981).

These authors, Hughes, Thompson and Rathje, see waste as a reflection of society's values and attitudes. The next section describes the philosophy of recent environmental movements as they relate to recycling.

2.3 RECYCLING AS AN IDEAL - ENVIRONMENTALISM

Some groups have always stressed the virtue of frugality and careful use of resources despite the apparent universal desire for the new product. The Amish Society of Central Pennsylvania in Lancaster County is one such group. Foster writes:

"...their deviation from the technological norm
...and their mistrust of machines and labor
saving devices, and their preference for
working with horses rather than tractors
highlights their ability to resist outside
social pressures and to use low-technology
instead of the array of labor-saving
devices" (Foster, 1980).

The Amish Society is one vestige of a close knit community in an ever increasing complex society. They have survived the onslaught of the modern, mobile, consumer-oriented, mass marketing society by using resources wisely and by their strong Christian philosophical convictions.

The non-Amish in the USA also discovered a renewed interest in environmental issues in the 1970s. Mendelker coined the phrase 'environmental decade' to describe the 1970s (Mendelker, 1980). It was a time of renewed interest in the management of the environmental problems which plagued the industrialized societies. The conservation movement began to influence and to permeate the thinking of individuals, community groups, business and governmental agencies. McHarg's book on Design with Nature reflected this change in attitude and direction. He asked people to work with nature, rather than against her (McHarg, 1971). People began to see the natural world and its harshness, beauty and unpredictability in a new way. The natural environment was seen as a backdrop to and escape from man's blemishes on the landscape. Quality of life took on a new importance. This new found environmental awareness for some meant an escape to the bush and towards a more self-sufficient lifestyle which the highly specialized and interdependent post-industrialized urban setting could not provide. For others, it meant growing their own vegetables in their suburban gardens. Others may have sold their second car to ride the bus or car pool to work in order to save energy.

The Deep Ecology philosophy and movement, the idea of a conserver society and the concept of sustainable development, played a significant role in drawing attention to the profligate ways of western society. A return to a more simple lifestyle in which one only uses the natural resources which can be replenished was one of the hallmarks of the deep ecology philosophy. Another hallmark was the idea that the entire world

is linked together ecologically so that resources must be shared by the richer nations with the poorer nations of the world. A third hallmark was the idea that individuals could and should make a difference by living out their philosophy of a simple lifestyle. Perhaps, the most important tenet was that military spending needed to be curtailed and to be rechanneled to more humane causes. Lastly, the idea that the western nations could learn from the examples of nonwestern peoples was advanced as a way out of the consumption pattern of the western nations. Recycling of waste products was/is a manifestation of the conservation ethos. This ethos recognised that ultimately there is no environmental free lunch. As a society, someone must pay for our industrialized conveniences and products. It may be directly in the cost of the product or it may be indirectly in the increase of some form of environmental pollution (Friends of the Earth, 1983; Gilpin, 1980).

Charles Reich, in the Greening of America, 1970, predicted a new type of revolution which would offer a new way of life based on communal values, rather than on exploitation and technological progress. The new hope of Reich's Consciousness III focused on the young people and their liberation from the Corporate State's excesses. The following quote expresses this 'new' thinking:

"Consciousness III must create a culture that knows how and when to use technology ... in pursuit of values that are derived from human sources" (Reich, 1970).

While Reich's political ideals were not directly to do with recycling, his ideas on the need to be in touch with nature and to again appreciate nature made him a popular prophet of the environmental decade. Many of his prescriptions were "simplistic, misleading, presumptuous," according to Peter Martin of the New York Times Book Review. However, many of Reich's ideas found a place in the hearts and minds of young people in the 1970s (Reich, 1970).

In Britain, Ronald C. Denny, in 1971, wrote a book called This Dirty World. In the first chapter, he describes the typical lifestyle of the British citizenry. He said:

"...the waste from the Everyman's household consists of a tremendous mixture of materials. It includes bottles, tin cans, plastic containers, food residues, dust and dirt, newspapers, rags, and sometimes garden wastes" (Denny, 1971).

Denny continues, "Man is probably the dirtiest animal in the world." He gives a very pessimistic view of Britain's environmental problems and potential solutions. On a global scale, with rising population, Denny predicted an even gloomier future for the human race. His main solution was for more

government involvement to make people care for their environment. He turned to the politician and legislator for the solution.

In contrast to Denny, Taylor saw the potential excesses of increased affluence. He challenged the wastemongers and the throw-away mentality as being immoral and destructive to the earth's natural beauty and resources. Taylor offered an old recipe to change the present course of human behaviour. Taylor called for the elimination of greed, vaulting ambition, unjust gain, and the return to a caring and just society (Taylor, 1975). Hence, the theme throughout the book was a call for recycling and the use of fewer resources.

John Skitt, a British waste disposal engineer, in his book entitled Waste Disposal Management and Practice 1978, saw a "...logical link between the use of raw materials and the production of waste. This inevitably leads to the question of recycling." Skitt claimed that household recycling must be in practice unseparated from the total materials cycle. In his conclusion on recycling policies, Skitt argued that economic growth and resource conservation represent conflicting objectives. Hence, he called for a compromise, with environmental standards taking precedence over economic growth. Recycling of materials for Skitt is one important tool in applying this priority (Skitt, 1978).

The Friends of the Earth compiled a little book called Only One Earth - An Introduction to Politics of Survival. Much of the contents for the book emerged from the Stockholm Conference held in 1972. Besides many of the now well known environmental principles which are contained in the book, one sentence is pertinent to recycling. It calls for us to "slow the depletion (of natural resources) by re-using everything." At the Stockholm gathering, strategies for solving environmental problems on a global scale were discussed. The participants came from most nations. A declaration of twenty three proposed principles on the human environment came out of the session. Many of these proposed principles are directly or indirectly related to solid waste management. For example, proposed principle number 4 was:

"The non-renewable resources of the earth must be employed in such a way as to guard against the danger of their future exhaustion" (Friends of The Earth, 1972).

The urgency of resource recovery was highlighted at this important world gathering. This sense of urgency continued through the 1970s.

In 1970, the first printing of The Environmental Handbook was made. Many noted environmentalists contributed to this little book edited by Garrett DeBell who also wrote a chapter on Recycling. He said: "recycling is a major part of the solution of

many environmental problems." Interestingly, he also noted the word 'recycle' didn't even appear in most dictionaries in 1970. DeBell called for a reduction in the rate of solid-waste generation and resource depletion. He stressed the need for both legislation and for citizens to think 'recycling' in their private lives (DeBell, 1970).

The Third Annual Northeastern Regional Antipollution Conference was held in 1970 at the College of Engineering, University of Rhode Island. The keynote speaker was Richard D. Vaughan, Director of Solid Waste Management, Environmental Control Administration. His paper was entitled "The Future Direction in Solid Waste Management: Recycling + Reuse." He cited the 1965 Solid Waste Disposal Act (PL-89-272) as a recognition that solid waste had become a national issue in the USA. One section of the Act read: "studies should be directed toward the conservation of natural resources by reducing the amount of waste and unsalvageable materials by recovery and utilization of potential resources in solid waste." This legislation in 1965 was an early recognition that "recycling of materials would become increasingly necessary not only for waste disposal but also to conserve resources." Vaughan suggested two reasons why the barriers to reusing valuable elements in municipal waste had not been overcome. These were the expense and difficulty of hand separation. He suggested that source separation could overcome to a large degree these problems. He saw recycling as an essential policy of the future (Vaughan, 1970).

The early 1970s also saw the rise to public prominence of groups like the Conservation Foundation. In 1973, they entitled one of their newsletters "The Land Pinch : Where Can We Put Our Wastes." The USA's 1968 waste disposal figures were cited as "...90% of the Nation's municipal wastes are disposed of on land...8% are incinerated, and 2% recycled or composted." The newsletter went on to decry the fact that "...the city (Washington, D.C.) built a modern incinerator with a price tag of \$20 million. So far, due to bugs and a shortage of operators, it is running at only half of capacity" (Odell, 1973).

The Conservation Newsletter in April, 1973, published an article entitled "Solid Waste: Can We Stem the Rising Tide?" There were 3 ways cited to ameliorate the solid waste problem: reduce the quantity and change the characteristics of waste products; improve collection and disposal methods; and/or reuse or recycle more waste materials (Odell, 1973).

Oregon, in an attempt to reuse more waste materials, was the first state to enact a law to induce the use of returnable bottles. The Oregon Law went into effect in October, 1972 (Turner, 1982). The State of Oregon lead the USA in recycling even though only a few communities carried out kerbside collection of recyclables. Collection and redemption depots were set up to minimize the cost of the cities' and towns' collection costs. While Oregon provided an important step in the emergence

of the recycling process, other states like Washington to the north, achieved a better result from the house to house collection of recyclables than did the state of Oregon. The opponents of deposit legislation have used these two states to argue their case for kerbside collection, but with no deposit legislation.

This led to source separation recycling. Thomas F. Williams, then Director of the Technical Information Staff of the EPA's Office of Solid Waste Management, said "source reduction would have to be done on a product-by-product basis...we are now beginning to do certain things in ways that tend to be more ecologically sound." Williams was optimistic about the public's understanding and concern for a better environment. He said

"...despite the current ascendancy of the throw-away mentality, I feel there's a strong ethical hatred of waste among most Americans. This will influence the development of public policy, as awareness of environmental problems continues to grow" (Odell, 1973).

Dennis Young wrote How Shall We Collect the Garbage? in 1972 for the Urban Institute. It focused not on the need for recycling, but on the need for efficiency of collecting and disposing of household waste. The only suggestion that Young made for recycling is on the inside page where the cartoon characters ask "why are you being so nice to your garbage?" The character answers "that it wasn't garbage until I got hold of it" (Young, 1972). The attitude towards waste among most engineers and administrators in the 1970s was that it should be disposed of as quickly and cheaply as possible. In 1973, USA National Commission on Productivity reported on "Opportunities for Improving Productivity in Solid Waste Collection." An important concept emerged that "in the long run, the most productive overall management of waste may well be determined by the extent to which discarded material can be reclaimed and reused" (National Commission on Productivity, 1973). This quote is significant because it recognized that there were more 'costs' involved than just the traditional input-output economic model that most economists applied. Reuse and recycling were emerging concepts valid in their own right when the total social and community costs were calculated.

In 1974, the National Centre for Resource Recovery, Inc. staff wrote a book on Resource Recovery from Municipal Solid Waste. In it, they reviewed the US Federal Government's role over the last 3 decades. From 1949 to 1965, the main activities were centred in the Environmental Engineering and Food Protection Division of the US Public Health Service. Their main role was to sponsor seminars and conferences on solid waste disposal. From 1965 with the passage of (PL 89-272), the Solid Waste Disposal Act, the Federal Government's involvement expanded to cover many areas such as research, grants to state/local governments, and as

a coordination role between different agencies. From 1966 to 1970, Health, Education, and Welfare Office (HEW), housed the Office of Solid Waste Management as part of the Public Health Service. This struggle between the health proponents and the engineers/administrators or health versus efficiency philosophies continued into the 1970s (National Center for Resource Recovery, 1974).

In October 1970, the Solid Waste Disposal Act was amended in order to provide greater financial assistance for demonstration and construction of disposal facilities. Hence, the 1970s proved to be the decade of centralized, capital-intensive, pilot projects as the money started to flow from Washington, D.C. The amended law became known as the Resource Recovery Act of 1970. This Act meant source separation recycling would have to wait until these demonstration plants were tested. Many of these plants became economic white elephants. The debate about how to deal with waste continued through the 1970s as the environmental and economic trade-offs for governments became more urgent due in part to the stricter legislation which made landfills less available for waste disposal (Mantell, 1975).

The recycling ideal caught many community groups' imagination, but few design engineers saw recycling as an alternative solution to the large centralized disposal plants. The 1970s saw a great boon to the building of large scale, unproven centralized plants as the Federal Government gave millions of dollars for plant construction (Levy & Rigo, 1976; Mantell, 1975; Shabecoff, 1986).

2.4 OVERSEAS' RECYCLING EXPERIENCE

2.4.1 North America

In 1970, it was estimated that resource recovery in the USA was already an \$8 billion business. Because of a growing awareness of the importance of preserving resources, resource recovery (the extraction of discarded materials for energy production, further reuse or recycling) continued to expand. Groups, such as the National Recycling Coalition (N.R.C.), a non-profit organization formed in 1978 to provide a broad-based support for the recovery of materials, reflected a growing interest in recycling across the USA and Canada (Mackenzie, 1985; Malcolm, 1984; Neuffer, 1987). Another group, the National Association of Recycling Industries (N.A.R.I.), has grown to over 1200 companies and has as a major goal the lobbying for laws to expand markets for secondary materials (Malcolm, 1984; Neuffer, 1987).

However, despite this growth of recycling interest and activity in the USA, many problems remain unsolved. For example, over 300 municipalities and several states have passed legislation requiring residents to separate their garbage into recyclables for collection. The enthusiasm which greeted such legislation was

dampened by the realization that, without markets to sell the collected items, the legislation often proved unsatisfactory and even counter-productive. Town fathers were criticized for monopolizing the waste business by making recycling mandatory. Thus, recycling by the public sector became an issue which attracted criticism from both the traditional waste managers and the ordinary citizen (Hershey, 1983). This criticism, coupled with the fall of prices in primary and secondary materials on the world market, cut deeply into the profitability and attractiveness of many recycling operations (Porter and Roberts, 1985; Sullivan, 1987).

R. L. Tichenor and E. F. Jansen Jr.'s report covered 5 systems which incorporated recycling and especially source separation as an integral component of the solid waste management for small communities. Several of New Hampshire's communities legislated mandatory source separation recycling. These communities, like Nottingham and Plymouth, N.H., have achieved a 95% resident compliance. However, despite the high compliance percentage, the mandatory programs had to cope with the arguments against the local government monopoly and the need to find markets for the recyclables. In the other communities where recycling was voluntary, 25-50 per cent participation has been recorded (Jansen and Tichenor, 1978).

In communities where source separation was optional, the ill-feeling provoked by this perceived unfair competition by governments was not so evident. The voluntary approach did not cause a "we" versus "them" mentality (Stefanelli, 1981). This was one reason why the voluntary approach was used in the Glenorchy Project.

In Seattle, Washington, an important pilot project, SORT, was conducted in 1979-80 to study the influence that a variable rate structure for garbage collection would have on residents' waste generation. Residents were charged a variable rate based on the number of garbage cans/bags put out each week for collection. Parallel to the variable rate structure incentive, residents were instructed and encouraged to separate their recyclables from the domestic waste stream for recovery. Results from this pilot project showed that the variable rate structure had only a marginal influence on residents' waste generation. The study also showed that the higher the socioeconomic status of a neighbourhood, the greater the participation rate (SCS Engineers, 1980).

Conn considered the importance of the Resource Conservation and Recovery Act of 1976 (RCRA) had in the USA. He found that many, if not most, states and local projects tended to be directed to a centralized system of resource recovery. The fact that (RCRA) 1976 was passed by Congress at all showed the sense of urgency in viewing the solid waste problem. Conn's conclusion from the California experience was that existing biases in the market place tended to give little incentive for communities to

provide recycling opportunities for their residents despite the obvious legislative mandate from Congress. He advocated that greater incentives to recycling be made available to local communities (Conn, 1978).

The National Centre for Resource Recovery in the 1970s prepared a monthly bulletin. In March, 1979, an article entitled "Resource Recovery Options for Smaller Communities" was particularly pertinent to the Glenorchy Project. The authors of the article cited the fact that resource recovery technology in the 1970s was limited essentially to the larger metropolitan areas where waste problems were more acute. While of the 250 Standard Metropolitan Statistical Areas (SMSA) in the USA, 33 had populations exceeding 1 million in 1970 and 32 had populations between 500,000 and one million. These 65 out of 250 SMSAs accounted for 50% of the USA's population and an even greater percentage of the solid waste generation. However, in 1979 more than 40% of the USA's population lived in municipalities of less than 100,000, not unlike Hobart's size. For these smaller communities, a source separation system was potentially the most appropriate for the following reasons:

- a moderate waste problem which could be partially solved by diverting materials from the normal disposal areas;
- a community concern for conservation of resources and/or a general interest in recycling;
- job creation possibilities for difficult-to-employ persons;
- increased desire to reduce litter; and
- opportunity to obtain revenues for other community projects.

The authors' summary pointed out the complexity of capital-intensive systems. They argued that most small communities (under 100,000) should look at alternative methods such as source separation recycling (National Centre for Resource Recovery, 1974; Baldwin & Schwartz, 1983).

M. J. Worrall of Maunsell Engineers, Australia, wrote a report on Waste Management based on his worldwide study tour in 1978. The report covered the different techniques of waste disposal from incineration (mass burning), refuse derived fuel (R.D.F.), pyrolysis, composting, pulverising (shredding), baling, transfer sanitary landfill, co-disposal (with sewage sludge) to source separation recycling. His conclusion on source separation schemes was that they relied on common ingredients for success: local ingenuity and enthusiasm (Worrall, 1980).

In the March 1981 edition of Environmental Comment, resource recovery was the theme. Douglas Wrenn, from his editorial tower, reviewed the 1970s in which the term recycling was used and misused. He drew the distinction between 'recycle' - meaning looping a material back into the process by which it was first formed as opposed to 'reuse' - meaning to utilize a product as is or slightly refurbished. Wrenn suggested that the 1970s saw the fundamental change in business attitudes from one of opposing recycling ideals to one of seeing the "...challenge and opportunity for future profit for those able and ready to supply methods and machinery" for recycling activities (Wrenn, 1981).

While business was beginning to see the opportunities associated with recycling, the Federal Government was also getting into the act. The US Environmental Protection Agency (EPA) in August 1978 published a booklet called Solid Waste Facts. In 1977, only 7% of the municipal solid waste stream was being recovered in the USA. Source separation accounted for 90% of the materials recovered from solid waste. The Resource Conservation and Recovery Act attempted to create a "demand pull" for recycled materials by requiring Federal agencies to procure items containing the highest percentage of recycled materials practicable, effective October 1978 (USEPA, 1978). In less than 8 years, recycling had moved from an ideal to a reality, at least in government agencies. The EPA saw its role as providing technical and financial assistance to state and local governments, development of economic incentives for recycling, and research development demonstrations and evaluations of technologies and systems for resource conservation (USEPA, 1978).

Another novel attempt at recovering used beverage containers, (UBCs), was the reverse vending machine. The concept was to pay the consumer of can an amount equal to the value of the recyclability of the can via a automated machine. It is estimated that in the USA there are 4000 supermarkets and retail outlets with reverse vending machines (Rypins and Papke, 1986).

Perhaps one of the telling indicators of how widespread recycling in the USA has become is in Pennsylvania, which has a population of about 13 million people. The number of kerbside collection schemes has grown from 5 in 1980 to 65 in 1985. In 1990, all communities in Pennsylvania with populations over 10,000, will be mandated to carry out kerbside recycling (Papp et al, 1985; Kók, 1981).

The other phenomenon which has reflected this growth in recycling in the USA over the past 8 years has been the emergence of many groups associated with recycling and the birth of the Journal of Recycling. This Oregon-based periodical covers most aspects of recycling.

The 1970s was a decade of US Federal Government support and encouragement of recycling and reuse of materials, especially through large centralized plants. (Stump, 1972; O'Riordan &

Turner, 1981). During the Reagan administrations, many of these grants and federal programs were scrapped. The impetus for recycling innovations was returned to the states. Economic considerations took priority over environmental concerns in the 1980s (Commoner, 1986).

2.4.2 Europe

The winter edition of the 1978 newsletter of the National Centre for Resource Recovery, Washington, D.C. discussed resource recovery in Europe. The five EEC countries covered were Denmark, France, Germany, Netherlands and the United Kingdom, and two non-EEC countries, Sweden and Norway. The common goal was "to strive for a reduction in the amount and an increase in the utilization of waste" (National Centre for Resource Recovery, 1978; Besselièvre, 1969; Third Scale Technology, 1982). The main governmental actions in Europe have ranged from prohibition of non-returnable soft-drink containers in Denmark to a government stockpiling scheme of newsprint in West Germany. These actions represent important initiatives in the promotion of recycling in Europe (Rennel et al, 1984).

2.5 AUSTRALIA'S RECYCLING EXPERIENCES

In Australia, recycling is a growing business (Packaging Council of Australia - 5, 1980). While only 11% of the 11.8 million tonnes of discarded materials were recycled in 1980, the growth of material recovery has been steady, particularly in paper, glass and aluminium (Pausacker & Andrews, 1983). Two examples of councils which have attempted to promote materials recovery are the Shires of Knox and Nunawading in Victoria (both eastern suburbs of Melbourne) which the writer visited in June 1981.

In 1975, Knox Shire Council set up a collection depot at the entrance to its tip for the processing of bottles, cans, metals, paper, and car batteries. This was accomplished mainly through the vision of Keith McClennan (Chief Health Inspector) and his associates. The Knox system incorporates recyclables from the regular garbage collection, the public drop-offs, and the paper and bottle collections by groups like the Boy Scouts. The operation has been run on a low-cost budget. In contrast, Nunawading Council in 1981 invested several million dollars in a transfer station/recycling depot. It is intended to reduce the transport costs by diverting from the landfill those recyclables which are collected by the commercial garbage collector, Berkeley Services, as well as the waste brought to the depot by the public. This new transfer station represented a commitment to the upgrading of the Council's waste management programme (Stone, 1969; Packaging Council of Australia - 1, 1981).

While this 'transfer station' approach may be the appropriate solution for a relatively affluent municipality in an urban area where landfill space is at a premium, there is serious doubt as to its applicability to less-affluent municipalities where landfill space is relatively inexpensive. Transportation and handling of the waste are the major expense items for waste management. The transfer stations still require a large expenditure for transportation and handling of the non-recyclables. The transfer station at best may be a partial solution, but can not serve as the total answer to the urban waste management problem (Golueke, 1980; Grinter, 1983; Logan, 1980; Victorian EPA, 1981).

In New South Wales, the Sydney Metropolitan Waste Authority was formed in 1975 (Metropolitan Waste Disposal Authority, 1980). As part of its waste strategy, the Authority, in conjunction with Australian Consolidated Industries (A.C.I.), has promoted source separation recycling (Simsmetal, undated; Australian Consolidated Industries, Community Services Department, 1981; Hamey, 1974).

Percy Harris summed up A.C.I.'s involvement in recycling over the past decade in Sydney. He is convinced that the solution lies with source separation at the home. A.C.I., in conjunction with the local councils, organized regular monthly door-to-door glass bottle collections which covered over 250,000 households. Harris stated that over 25% of all glass bottles, jars and flagons marketed were being recovered for reuse or recycling. With an extensive education program, Harris suggested that the potential for total or near total recovery of glass could be achieved (Harris, 1978).

One of Australia's first weekly, multi-material source separation recycling schemes commenced in September 1981 in the Perth suburb of Carlisle. This three month pilot study was sponsored by the Carlisle Council, which supplied containers for the recyclables (glass, paper, metal, and organics) and collected them on the normal garbage collection run. The initial response from the community was encouraging, with only a small percentage of residents not participating in the first weeks of the project (Edwards, 1981).

The author wrote to the Australian Environmental Council, Conservation Commission of the Northern Territory, Department of Environment and Planning, South Australia, State Pollution Control Commission, New South Wales Government, and all the other relevant agencies concerned with recycling in Australia. The agencies named above responded with a letter. The letters were useful for gaining an overview of what the state of recycling was in Australia. Appendix A details the responses from the various conservation commissions around Australia and their involvement in recycling.

N.S.W. provided a detailed listing of recycling programmes (Anon - 1, 1984). In discussion with officers from around Australia, New South Wales was cited as the leader in recycling as Percy Harris suggested. The Sydney-based N.S.W.'s Solid Waste Authority reinforced Harris' conclusion that N.S.W. was the recycling leader in Australia. The glass collection from A.C.I. and Smorgans-Glass Containers (G.C.L.) provided for about 250,000 Sydney households with a monthly door to door collection, and recover about 220 million bottles annually. Paper was collected about once every six weeks by A.P.M. It was claimed that 400,000 tonnes of paper and cardboard throughout Australia were recovered, with about 1/3 coming from New South Wales. Steel cans were not used as a beverage container in N.S.W., except in the steel cities of Wollongong and Newcastle. B.H.P. claimed 20% of steel cans used were recycled. The distinction was made between recycling and reuse. In the latter category, it was suggested that milk, some soft-drink, beer, and wine bottles were the only items being reused.

The reason the Conservation Commission of the Northern Territory gave for limited recycling was that "the geographic position of the Territory in relationship to major markets, coupled with a small and fairly dispersed local population precludes the economic recycling of materials."

In South Australia, the Beverage Container Act 1975-76 was cited as the major achievement of recycling (South Australian Department of the Environment and Planning, 1980).

In Canberra, most recycling activities were provided at Canberra's 2 major landfill sites. Paper was collected from householders for recycling as well.

2.6 TASMANIA'S RECYCLING EXPERIENCES

In Tasmania seven main approaches to recycling besides the Glenorchy Project have been observed by the author

Regular Collections

The first approach involved charitable groups making regular collections of recyclables. In Wynyard, the manager of St. Vincent de Paul, Albert Stolp, initiated a regular collection of glass, paper, rags, and metal (Atkinson, 1984). The St. Vincent de Paul trucks followed the council trucks on garbage collection day through the streets of Wynyard, picking up the recyclables set out beside the regular garbage. This arrangement has been operating for several years.

Drop-off Centres

The second approach was the drop-off centre concept. The Self-Help workshops around the State have set up areas for the

public to bring recyclables for processing. In Launceston, the Amy Street Self-Help has committed its efforts to this concept with the recent introduction of the A.C.I.'s 'bottle bank' (a system where 1 cent per bottle is paid to the public for certain non-refillable bottles). This drop-off concept depends on the public's interest in bringing the recyclables to the site.

Random Pick-up

The third type of recycling has been the random pick-up approach. Charitable groups, like the Salvation Army and St. Vincent de Paul, pick up domestic recyclables on request if and when their collection trucks are in the general area. This 'ad hoc' approach is suitable for furniture and other larger items. It lacks a systematic approach for the recovery of glass, paper and cans.

Periodic Bottle Drives

The fourth approach to recycling has been the monthly or bi-monthly bottle drives carried out by groups such as the Boy Scouts, service and sports' clubs. These are usually in a specific area, but because they are irregular and depend on civic-minded adults to organize, their lasting recovery rates of glass, paper and cans are limited.

Service Station Bottle Depot

The fifth recycling approach which has been operating for several years is the service station bottle depot. The drop-off points were located around the Hobart Metropolitan area. The Tasmanian Bottle Company collects the bottles and pays a percentage of the fees to the Hospital Fund. At the Glenorchy landfill entrance, there was a similar arrangement whereby the receipts from the bottles are shared with the bottle merchant/sorter and the Mayor's Charity Fund.

Traditional Bottle Return (Milk and Softdrinks)

The sixth approach was the traditional recycling of empty milk bottles (12% of the milk sold in Tasmania was bottled in 1981) and home deliveries of Cascade cordials and Huon Cry soft drinks. These house-to-house pick-ups involved a regular routing system. This system was single purpose, required big trucks, and produced a low margin of profit. There is a real question as to how long this method of recycling will continue. Recently in the Mercury, January 14, 1987, a story on the demise of the milk bottle in Western Australia was written. In Tasmania, the milk bottle remains a sentimental favourite to continue for the immediate future.

Deposit Bottles

The last approach has been the deposit bottle which customers bring to corner stores for refunds. The corner stores, in effect, are the middle men between the distributor/bottler and the customer. This system works reasonably well because the customer will generally only want a deposit refund on a few bottles at a time. Upon return, the deposit is refunded. If and when deposit legislation is enacted, a flood of deposit bottles could cause major storage space problems for the small corner store owner.

Other recycling attempts in the Hobart area over the past five years which have not proven successful were the Cascade Bottling Company's 10 week project in the Kingston area, the Hobart Tip Community Employment Programme (C.E.P.) scheme, and the TasWaste paper collection and export scheme. These three attempts at recycling all failed for different reasons. For example, the Cascade Bottling Company ran a 10-week programme in 1983 in Kingston. However, because residents knew the programme was going to end in 10 weeks, the participation rates fell off dramatically towards the end according to Graeme Little of Cascade. The Hobart Tip C.E.P. project failed because it had too much public money. It became a case of poor management of the \$60,000+ which the federal government made available. The whole idea of recycling at a tip site reflected the lack of creative thinking, as the project ended up an embarrassment to the Hobart City Council. The TasWaste Paper collection and export scheme failed despite large sums of private monies being spent. As with the Hobart Tip C.E.P. scheme, there was a lack of willingness on the part of the managers to accept advice and to do the needed research into the social habits of residents and workers. Regular collections became irregular, if at all. These failures should prove instructive as the recycling strategies evolve for the Hobart area (Brenner 1-2-3-4, 1985).

These recycling experiences in Tasmania have helped shape the Glenorchy Project by observing the limitations of each of the approaches. The Wynyard example was efficient, but at times confusing for the collector of the recyclables. It was felt that collecting the day before the regular collection would reduce the confusion of what was set out for the regular garbage and what were the recyclables. Also, if for some reason the resident did not put their recyclables out in time, then the normal garbage collector could pick up the recyclables without too long a period for possible breakage or too many phone calls reporting missed recyclables.

The Glenorchy Project also was set up on a weekly basis to ensure ease of recognition of the collection day by the householder. The semi-monthly or monthly programmes require more thought by the householders. The theory was there would be more peaks and valleys in putting recyclables out for collection, if collections were not weekly.

These different Tasmanian approaches served as important background data for the design of the Glenorchy Project by selecting the best of all the approaches tried elsewhere. The recommendations in Chapter 8 are based on the Glenorchy experience and other recycling projects.

3 GLENORCHY STUDY AREA

3.1 HISTORICAL OVERVIEW

Glenorchy is Tasmania's second largest city with a 1981 population of about 45,000 people. It was first settled by Europeans in 1809. Thomas O'Brien received the original land grant near the site of the O'Brien Bridge. J. P. Fawcner, who was associated with John Batman in the founding of the city of Melbourne, was also an early land grant holder in the Claremont area, the northern part of the Glenorchy Municipality, near the present-day Cadbury's factory (Australian Bureau of Statistics, 1981). Plate 3-1 shows Glenorchy from Cadbury's looking southwest along the Derwent River.

Glenorchy's spatial development has been essentially linear, bounded by the River Derwent to the immediate east and the lower range of Mt. Wellington to the immediate west. In the early 1900s, Glenorchy's fertile river plain served as a market garden for the expanding population of Hobart (Australian Bureau of Statistics, 1981).

From 1920 to 1940, as industry expanded and the railway to the north was constructed, Glenorchy's pattern of land usage evolved from primarily agricultural to a combination of industrial, commercial, and residential land uses. In order to house the growing number of workers in the 1920s and later, the State Housing Division constructed many of Hobart's original government homes in Glenorchy. Many of these publicly-built homes are now privately owned (Australian Bureau of Statistics, 1981).

The Glenorchy Local Government Area (LGA), extends from the Moonah suburb, which is contiguous to Hobart on the south, to Granton on the north. (LGAs are spatially the same as the municipality.) The Municipality covers 13,000 hectares. It is punctuated with ethnic enclaves. Glenorchy is a mixture of income groups, old and new, public and private housing estates, and a wide range of industrial, commercial and institutional land uses.

It was into this milieu of urban diversity that the Glenorchy source separation recycling project was launched in 1981. Plate 3-2 shows the Glenorchy Council Building, which is located in the heart of downtown Glenorchy on Main Street.



Plate 3-1

View of Glenorchy Looking Southwest from
Cadbury's Chocolate Factory; Mt. Wellington
Range is in the Background

3.2 ROLES OF LOCAL AND STATE GOVERNMENT, PRIVATE OPERATORS, COMMUNITY ORGANIZATIONS IN RECYCLING

In the past, the local government in Tasmania has shied away from direct involvement in recycling mainly due to the perceived cost of double collection and the relatively inexpensive landfills. Glenorchy Council was no exception to this pattern. The Glenorchy Council was only mildly supportive of the Glenorchy Recycling Project.

The State Government of Tasmania has a Department of Solid Waste Management. However, there has been little emphasis on recycling until recently. The main emphasis has been to enforce environmental regulations on the various landfills around the state. The local consortium of Municipal Officials Association and the state officials have combined to sponsor a study on the feasibility of recycling. The results are waiting for publications.

Community organizations involved in recycling have been mainly self-help groups, the Salvation Army, St. Vincent de Paul, Boy Scouts and the service clubs which have sponsored various collections in the past on an ad-hoc basis.

In planning the Glenorchy Study, it was decided that the most productive way to approach the collection and marketing of the Glenorchy recyclables was by way of an existing charitable group which already had experience in recycling. This was the reason St. Vincent de Paul was selected. The Glenorchy City Council was supportive, but not interested in assuming a more direct involvement in the Study process.

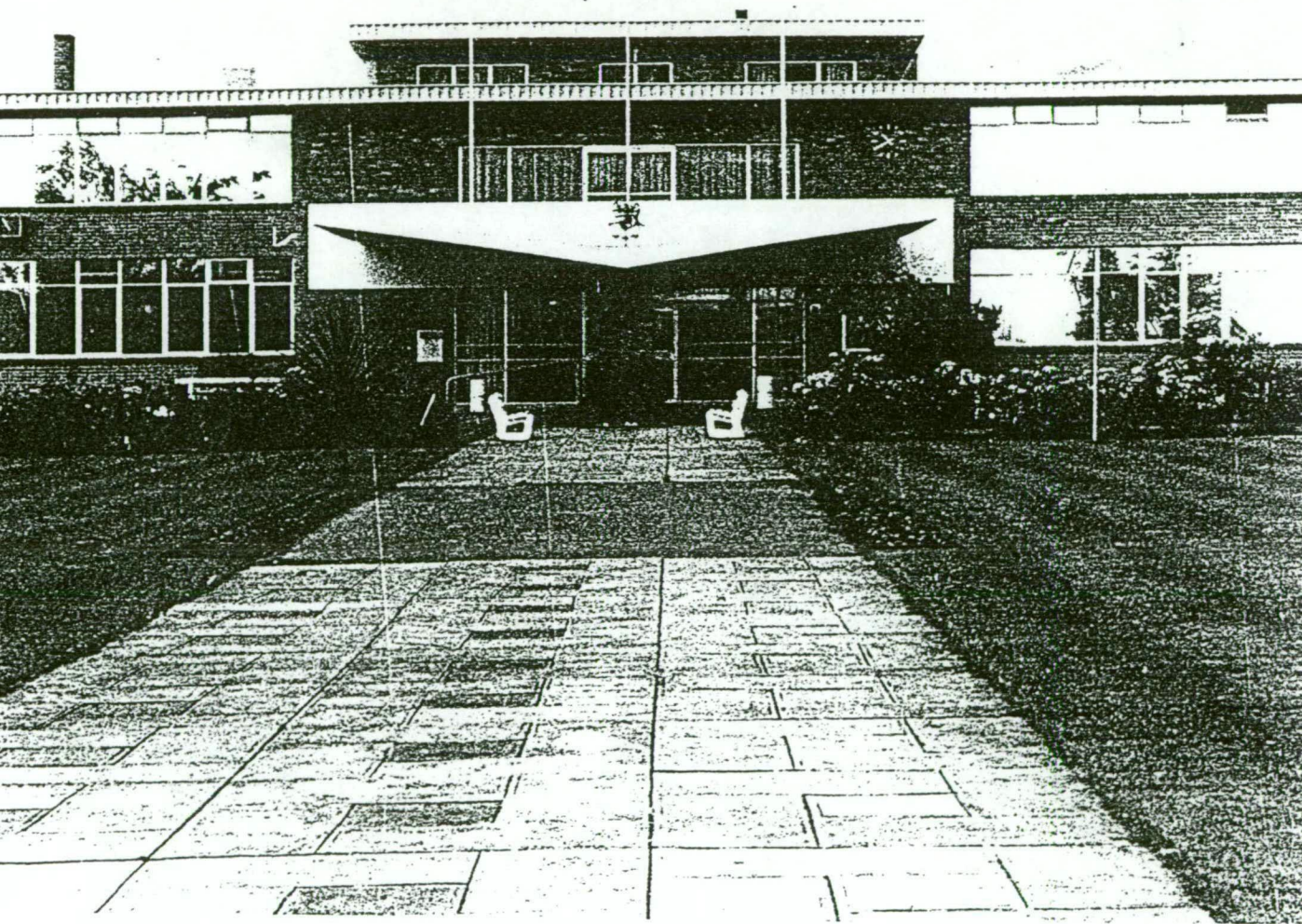


Plate 3-2

Glenorchy Council Building on Main Road

TABLE 3-1 1976 CENSUS DATA

	HOUSEHOLD INCOME Over \$15,000		OCCUPATION (MAJOR GROUP O)		QUALIFICATIONS Diploma up	
	no.	%	no.	%	no.	%
Neighbourhood						
A	116	37.9	85	17.4	69	8.0
B	78	25.5	52	11.1	33	4.3
C	24	13.7	8	4.2	6	1.7
Glenorchy						
	360	1.2	1659	9.1	904	3.0
Hobart						
	3260	2.8	10605	15.6	8393	7.1
Tasmania						
	5902	2.1	20611	12.6	16023	5.6
Australia						
	149796	2.6	1367230	11.8	594810	6.0

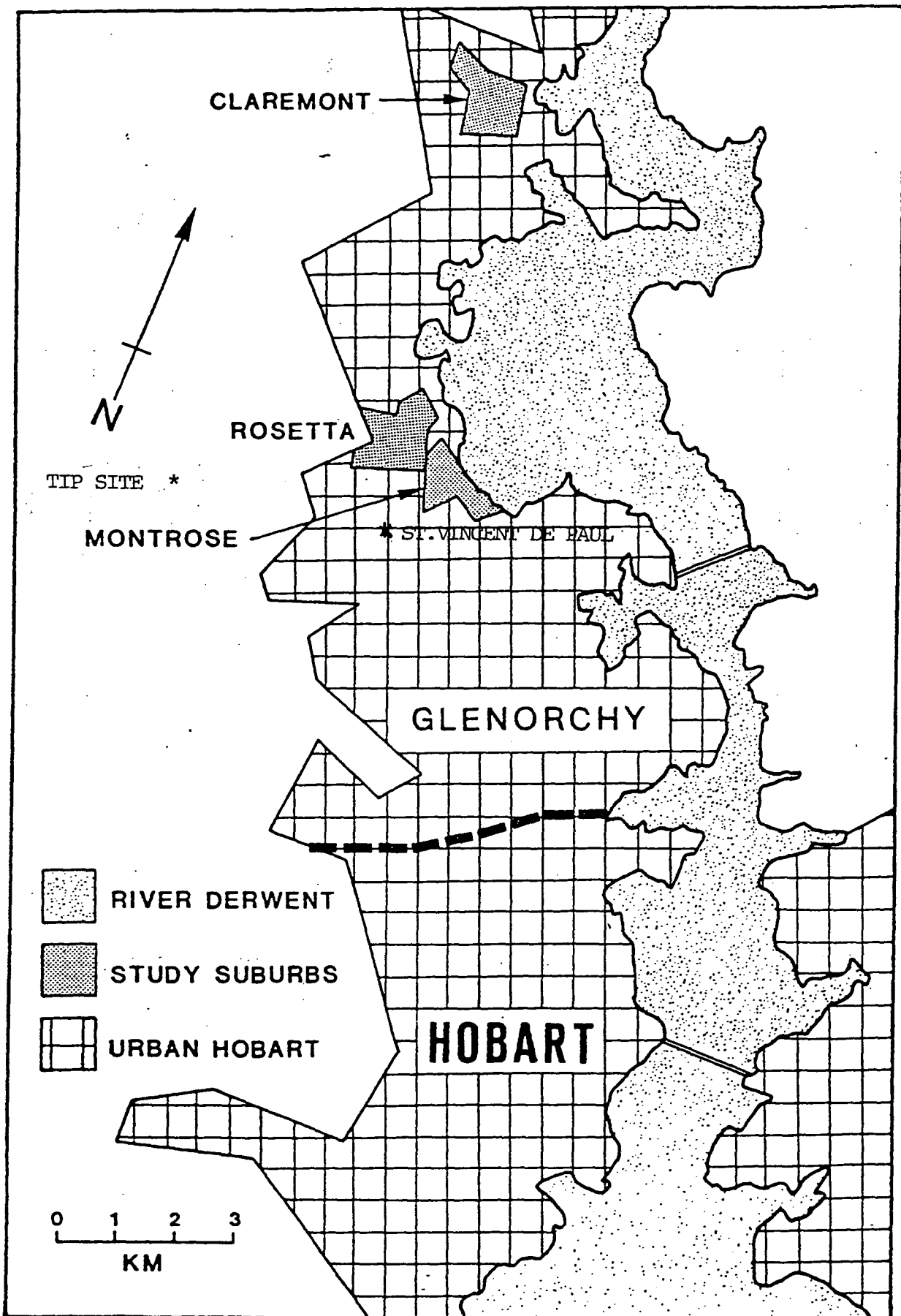
The data in Table 3-1 show the comparison between the Glenorchy neighbourhoods, Glenorchy, Hobart and Tasmania and Australia. Neighbourhood A, the highest socioeconomic neighbourhood, scored highest in all categories. These data confirmed the selection of the three test neighbourhoods as representing a range from the high to the low.

Table 3-1 also shows that Neighbourhood A had a higher percentage (37.9%) of households with an income over \$15,000 than Glenorchy as a whole or Hobart, Tasmania, and Australia. This relatively high percentage of households over \$15,000 annual income showed that Neighbourhood A was a cluster of high income households.

The occupation category showed that 17.4% in Neighbourhood A had a white collar occupation. This was almost double the percentage of white collar workers for Glenorchy as a whole.

FIGURE 3-1

Location Plan - Glenorchy Neighbourhoods



In terms of qualifications, Neighbourhood A also led Hobart with 8.0% to 7.1%, which clearly established the ranking of Neighbourhood A as having a well-qualified populace.

3.3 SELECTION CRITERIA FOR THE THREE TEST NEIGHBOURHOODS

Glenorchy was selected as the test municipality because it had a range of socio-economic neighbourhoods. It was also selected for the practical reason that St. Vincent de Paul, Glenorchy branch, was willing to be the collector of the recyclables.

The criteria for the test neighbourhood selection were: education, occupation and household income (Phillips, 1976; Gardner, 1978; Burton & Cherry, 1970; Parl, 1967).

The three prototype neighbourhoods, A (high), B (middle) and C (low), were selected according to the three criteria using the 1976 census data for all the neighbourhoods (i.e. collection districts). (A collection district is the smallest geographical area for census data gathering). The selection process involved assigning all the collection districts in the urban areas of Glenorchy a rating for each of the three criteria of education, occupation and household income. After all the collection districts were scored, the lowest and highest scores for the collection districts were selected. This insured the widest range of extremes. The middle collection district was selected as the closest to the mean score from the highest and lowest (Parl, 1967; Young, 1972).

Below are definitions of the three criteria used:

Education: - The percentage of persons holding a Diploma, Bachelor Degree, Graduate Diploma or Degree was tallied.

Occupation: - The percentage of people in the census category of professional grouping (white collar, major group o) was tallied. The o category was used to group the various categories of white collar workers.

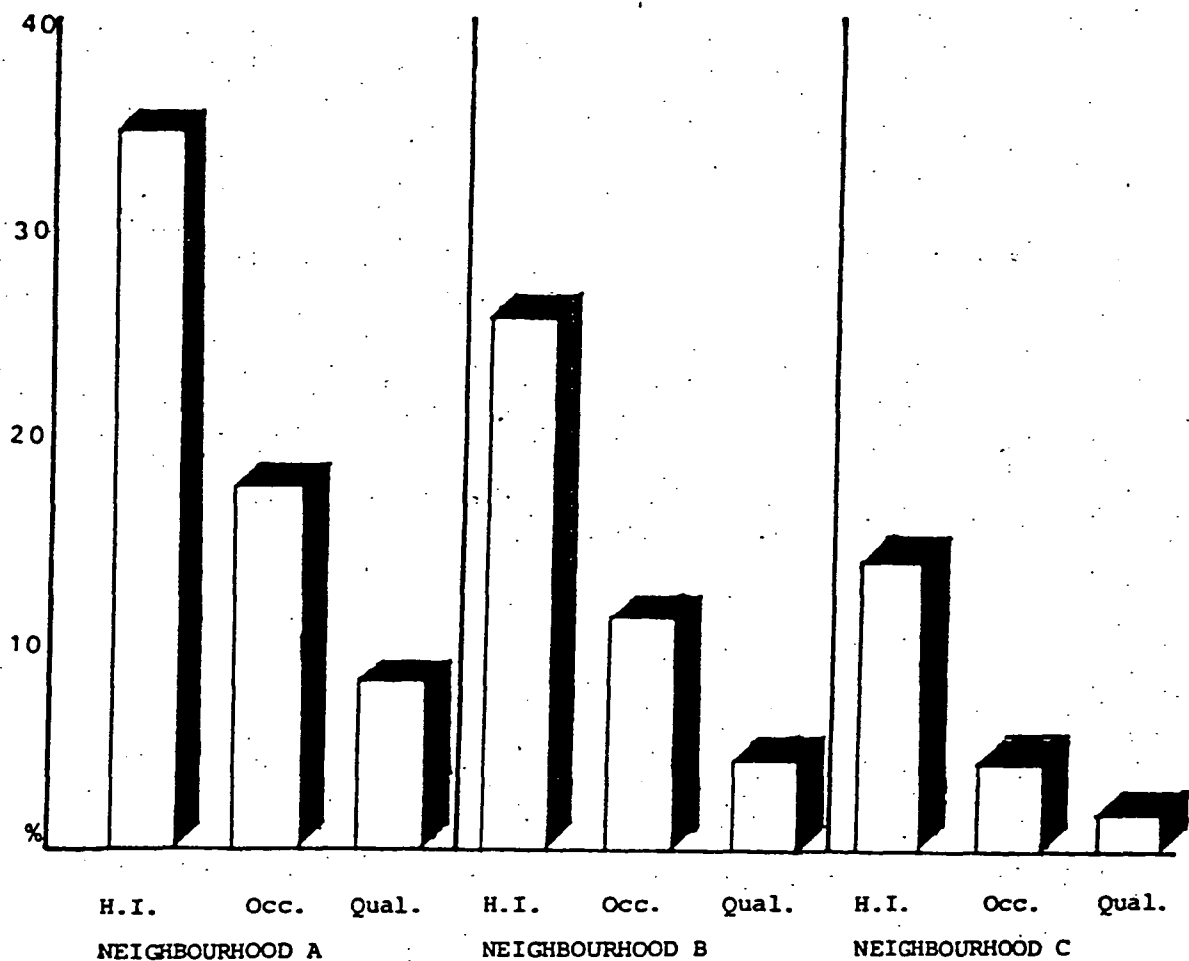
Household Income: - Income was defined as the annual household income. The percentage of the collection districts' households with an income over \$15,000 was tallied.

3.4 CHARACTERISTICS OF THE TEST NEIGHBOURHOODS

Neighbourhood A: - The A Neighbourhood selected was the Rosetta area. Most of this area is characterized by being on higher ground, with a superb outlook across the Derwent River to the Eastern Shore. The population was primarily in the 30-55 year old range, in their highest earning years of employment. This neighbourhood had the highest percentage of professional

FIGURE 3-2

INITIAL SELECTION OF NEIGHBORHOODS (COLLECTION DISTRICTS)



Key

Household Income H.I.
Occupation Occ.
Qualifications Qual.

Source: Australian Bureau of Statistics of 1976

workers. The housing stock was almost all privately owned and of the post-1960 vintage. There were 275 total households.

The Questionnaire Survey data indicated that Neighbourhood A had an average number of persons per household of 3.03. Only 43% of the surveyed households had children under 18 years of age. This meant that a majority were in the post-family category. Of those households having children under 18 years of age, the average number of children was 2.34.

Educationally, according to the Questionnaire Survey, only about 9% had not completed at least Grade 10 High School, indicating a well-educated population. Over 20% have received a Technical College or Tertiary College/University education. However, 15.6% refused to answer the question on education levels. The questionnaire survey showed that there was no one listed as unemployed. Over 30% claimed white collar status, while over 18% said they were blue collar workers. Over 13% said they were aged pensioners.

The household income question had the largest number of respondees unwilling to give an answer, over 33%. Of those answering, 16.7% said they had an income above \$25,000.

Neighbourhood A confirmed statistically its higher socioeconomic status compared to Neighbourhoods' B and C. However, a large number of respondees did not see fit to answer the questions.

Neighbourhood B: - The B Neighbourhood selected was the Glenorchy-Grove Road area. This area was a mixture of industrial, commercial and residential land uses cut in half by the Main Road. A large percentage of the population was between 50-70 years of age. The elderly units off Mary's Hope Road reflected the older population in this collection district. The housing stock was well established and generally well maintained. Much of the housing was constructed in the post World War II era. There were 302 total households.

Neighbourhood B's characteristics based on the Questionnaire Survey showed that its average number of persons per household was 2.81, considerably less than Neighbourhood A's, 3.03. It also showed that it had fewer households with persons under 18 years of age than Neighbourhood A or C. However, in those households with children under 18, the average number per household was 3.32, which was larger than A or C Neighbourhoods. These data suggest that the classic situation of younger families moving back into an older neighbourhood was occurring.

The Questionnaire Survey found that educationally, Neighbourhood B had over 28% who did not finish Grade 10. This is 20% higher than Neighbourhood A. This partially reflects the older population in B who may not have had the same educational opportunities as some of the younger people in A and C.

Occupationally, the blue collar workers exceeded the white collar group by over 3%. Additionally, the aged pensioner percentage was 24.7%, the highest of all three neighbourhoods. This reinforced the fact that Neighbourhood B was the oldest, with new residents recently starting to move back into the neighbourhood.

Household income data showed that most people claimed they had less than \$15,000 annual income. No one claimed to have an income over \$25,000.

Neighbourhood C: - Based on the above criteria, the C Neighbourhood selected was the Claremont area. The boundaries were: Box Hill Avenue on the south; Hilton Road on the north; Main Road on the east and Wyndham Avenue on the west.

The C Neighbourhood was a mixture of public and private housing built in the 1950s and 1960s. Most of the employed were in the trades' occupations. The age structure was the most balanced of the three neighbourhoods, between pre-family, family formation and post-family. There were 254 total households.

Neighbourhood C was the lowest of the test neighbourhoods in terms of household income, educational qualifications and occupational status. Neighbourhood C had a majority of households with children under 18 (56%) and the most people per household (3.64). Neighbourhood C did show an increase in the number of people per household which the survey figures indicated were due to a younger population with more families with young persons under 18 years.

3.5 CONCEPTS OF THE STUDY

The following concepts were purported and tested:

Concept 1 - that Neighbourhood's A higher socioeconomic status would produce more confidence in householders to spread the word to other neighbours about the Recycling Project than in Neighbourhoods B or C;

Concept 2 - that there would be a steady increase in Neighbourhood A's participation while in Neighbourhood B and C, because of in their lower social standing in the community, a slow but steady decline would result;

Concept 3 - that Neighbourhood's A higher purchasing power and consumption level would mean that Neighbourhood A would generate more \$ value of recyclables than Neighbourhood B or C;

Concept 4 - that those householders in all three neighbourhoods that responded yes initially to participating, would be the highest and most consistent participants over the life of the Project;

Concept 5 - that those householders who answered no or maybe would start participating once the project started and they saw the positive side of the Project;

Concept 6 - that the difference between what householders said they would do and what they actually did in practice during the life of the Project would be significant.

Concept 7 - that those of the contacted households in all neighbourhoods would produce higher participation rates,

Concept 8 - that those households not contacted via the questionnaire survey would produce higher participation rates in Neighbourhood A than in the other 2 neighbourhoods;

Concept 9 - that there would be an equalization of participation over the life of the Project between the contacted and non contacted households in the three neighbourhoods;

Concept 10 - that non-contacted households would begin to participate and surpass contacted households in the three neighbourhoods because of example of neighbours and word-of-mouth; and

Concept 11 - that the households contacted at the time of the Questionnaire Survey would participate initially for the first two quarters at a greater rate than the non-contacted households;

The results of these concepts are detailed in Chapter 7. The next chapter describes the questionnaire survey results.

4 THE QUESTIONNAIRE SURVEY

The Questionnaire Survey, conducted in October and November of 1981, was an important component of the source separation recycling project. The technique of using a questionnaire survey as part of the publicity programme was unique. The questionnaire survey proved to be an important source of useful data as well as a means of establishing personal contact with the residents in the selected neighbourhoods (Babbie, 1973).

The questionnaire phase of the Project was designed to overcome some of the problems which other source separation recycling projects have encountered such as the high cost of publicity, uncertainty about the start of the project, the lack of personal contact with potential participants, and a lack of an opportunity to answer questions about the project on the spot (Cohen, 1979; Brenner, 1985).

The Questionnaire Survey was intended to discover householders' attitudes to, and practices of, disposal of household waste. In addition, it ascertained householders' willingness to participate in the source separation recycling Project. Records were kept of the householders' actual participation in the Project, and a comparison was made between the contacted versus non-contacted householders' participation rates. ('Contacted' refers to all those householders who actually were seen in person by the interviewers.)

The Questionnaire Survey costs included the wages for the interviewers, the printing of the questionnaires and introductory letter and the processing of the questionnaire. The full description and results of the Questionnaire Survey are contained in the document on Practices of Waste Disposal and Attitudes to Source Separation Recycling in Glenorchy, Tasmania, Environmental Studies Working Paper 18, 1985 (Clouser, 1985).

The Questionnaire Survey Methodology

The intention of the Questionnaire Survey was to systematically sample every other household in each of the 3 test neighbourhoods. The neighbourhoods to be surveyed were selected by first computing the highest and lowest collection districts (CD) of the 1976 Census data for Glenorchy's urban areas based on the three categories of education, qualifications and income. The middle collection district was the nearest one to the mean based on the three areas.

The systematic sampling intention was to interview 50% of each collection district's households, or every other household. The reason for sampling every other household was to test if the visual example of participation would influence the non-contacted

households to participate with having only received a brochure and no personal contact. The interviewers returned twice to the missed households before designating the household a non-contacted household. This is why only 40% of the households were sampled.

In Neighbourhood A, 98 out of 275 householder were interviewed or 35.6%. In Neighbourhood B, 115 out of 302 householders were interviewed or 38.1%. Out of 254 householders in Neighbourhood C, 118 or 46.5% were interviewed. These percentages were useful in gaining comparative data between the contacted and non-contacted householders.

Biases in the survey would have been reflected more in the way the surveyors conducted themselves to the householders than in the format of the questionnaire itself. Improvements in the survey methodology could have been made with a follow-up questionnaire after 2 or 3 quarters of the actual programme's operation had begun. This would have helped either reinforce the view of the householders towards recycling or would given the householders an opportunity to change their opinions. The results of a potential follow-up survey would have produced a comparison to make needed changes, if warranted. However, the time and cost of a follow-up survey made it prohibitive.

The Questionnaire Survey As Publicity

A key purpose of the Questionnaire Survey was to use it as the initial means of publicity, thus reducing the cost of publicity (New Zealand Department of Trade and Industry, 1983).

The success of a source separation recycling scheme is dependent on many factors (Packaging Council of Australia-4, 1980). One of the key factors is effective publicity of the project. Since the Glenorchy Project had to operate on a low budget, it was imperative that maximum use of the questionnaire survey be made as a means of publicity. The Questionnaire Survey was administered by the author and students from the Tasmanian State Institute of Technology. The students were personally trained and monitored by the author. The interviews were carried out in October and November of 1981 prior to the start-up of the recycling project. The questionnaire was administered immediately after the resident had had an opportunity to read the introductory letter. This served several purposes:

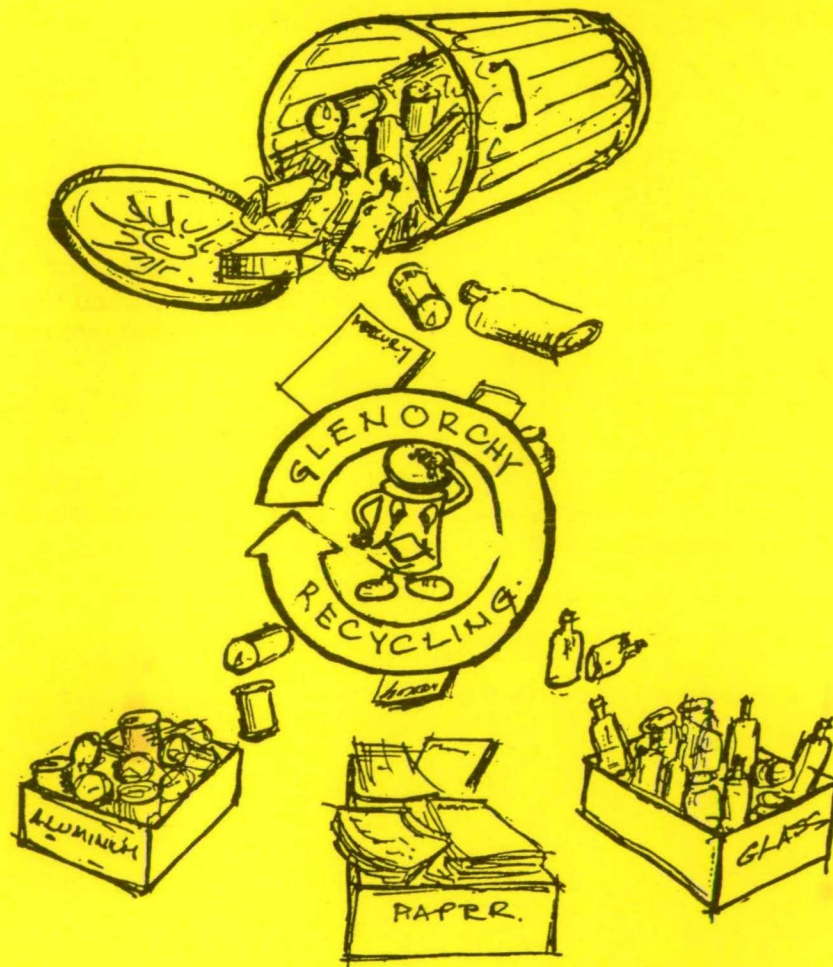
- . first, the letter provided the resident with an official reminder of the project;
- . second, reading it helped create a transitional stage for the survey period which provided a psychological aid for both the interviewer and the interviewee;

Figure 4-0

ST VINCENT DE PAUL

WILL MAKE
A WEEKLY COLLECTION
OF
Glass, Paper and Aluminium Cans
each

WEDNESDAY



PLEASE KEEP THIS CARD AS A REMINDER OF THE COLLECTION DAY

OVER PLEASE

Figure 4-0 (cont'd)

Dear Householder

Your neighbourhood has been selected to participate in a community recycling project.

PLEASE: Place your *paper* — including newspaper, magazines and other clean paper; your *glass* — including all bottles, jars and flagons; your *aluminium drink cans* (not steel cans)



AT:

1. The kerbside.
2. Visible from the roadway.
3. Before 9.30a.m. on the day of collection.
4. In cardboard containers or in a similar container, tied down to keep from blowing around.

THANK YOU! For supporting this community recycling project. Your support and interest will help conserve valuable raw materials and will aid a charitable group —

St Vincent de Paul

**PHONE ENQUIRIES: 726210
728877**

JOINT PROJECT BY
ST VINCENT DE PAUL
LOCAL INDUSTRIES
UNIVERSITY OF TASMANIA
TASMANIAN COLLEGE OF
ADVANCED EDUCATION

- . third, this procedure constituted a personal contact which was intended to leave a lasting impression on the resident;

- . fourth, it prepared the way for later reinforcement by the distribution of a circular to all householders;

- . fifth, it enabled the interviewee to ask any questions about the scheme which were not clear at the outset.

Each questionnaire was administered personally, taking about 20 minutes. Several weeks after the initial contact and one week before the collection of the recyclables, a how-to circular (Figure 4-0) was distributed to all households in the three test neighbourhoods describing the Project. This represented another stage in the publicity of the Project in that it served as reinforcement of the initial contact.

This unique publicity process was designed after a literature search of source separation projects in the USA, Australia, and personal visits to several projects in Melbourne, Victoria and Sydney, N.S.W.

In the USA, 91% of the source separation projects used newspaper advertisements prior to implementation of a project. A total of 50.6% used circulars, while the third most used publicity medium was announcements via civic groups. Cohen's survey had a rating for the relative effectiveness of different types of publicity. The ranking is from 6 points for the most effective to 1 point for the least effective (Cohen, 1979). Cohen's survey is relevant to the Glenorchy Study in that it described the various publicity techniques and their relative effectiveness. Maximum effectiveness (impact) with the least expensive form of publicity was the goal for the Glenorchy Study.

TABLE 4-1

EFFECTIVENESS OF PUBLICITY METHODS IN USA SOURCE SEPARATION
PROJECTS (COHEN 1979)

BEST VALUE	METHOD
6	Letter from local government
5	Circulars, calendars, or notices in utility billing
4	Newspaper articles or advertisements
3	Contests, speeches, announcements to/from civic groups, school programmes
2	Radio/T.V. spots
1	Posters, buttons

Another example of publicity was the Seattle SORT programme. This programme was city-wide and backed by the city government. The budget allowed for \$26,000 to be allocated for a public information consultant and other media coverage of the SORT programme. An indication of the difficulty in obtaining better results from more publicity is summed up in the following quote from the SORT's summary:

"None of the public information programs
were successful in increasing participation
beyond the initial rate" (SCS Engineers, 1981).

The Seattle project was atypical for two reasons. It was city-wide and backed by the local government. It had a budget of almost \$200,000 for the period 1 July 1978 to 31 October 1979. Most communities have neither large sums of money nor the public employees to carry out their recycling schemes. Most of these source separation schemes received their monetary support and their labour input from local civic groups, garden clubs, schools, and environmentally-conscious groups (Mosley, 1979).

In most of the projects Cohen surveyed, publicity was curtailed after the projects were up and running. There was a shift from cost-intensive types of publicity like circulars, posters, calendars, and newspaper advertisements to the less-expensive form like speeches, and/or mail-outs with Council utility bills and school notices. Cost played a key factor in the publicity process (Cohen, 1979).

The Australian experience produced different models for publicity. For example, in 1981 in the Perth suburb of Carlisle, Western Australia, a questionnaire was employed prior to the commencement of the project. It was a drop-off, pick-up later type questionnaire, and was accompanied by a circular spelling out the details of the scheme (Edwards, 1981).

In Sydney, A.C.I. utilizes a calendar brochure distributed at six monthly intervals in connection with the monthly collection of glass.

The Glenorchy Project attempted to incorporate the best and most practical aspects of all these publicity techniques (Tasmanian Conservation Trust, 1983). The second part of publicity was the use of a follow-up circular. (See Figure 4-0) The brochure was distributed to all households in each neighbourhood prior to the start of the collection of the recyclables. The circular was also used as a reminder to householders after the project was up and running. This follow-up publicity was intended to reinforce the existing patterns of those householders already participating in the scheme and to induce their non-participating neighbours to start participating in the scheme.

Survey Results and General Format

The survey results are organized into 11 separate sections covering the 16 questions put to 331 households in the 3 test neighbourhoods of Glenorchy. The first 3 sections deal with the way householders disposed of their glass bottles, paper and cans. The remaining sections contain information concerning householders' attitudes to the waste disposal problem and provide information about the householders themselves.

Each section is organized on the same format. First, the topic of the section is specified by a statement of definitions which identify a particular item which people were questioned in the survey. Next, a rationale is given for including the topic in the questionnaire. This is followed by a presentation of the data, in tabular and graphical form, obtained in response to each question.

4.1 GLASS, QUESTIONS 1 to 4

Definitions

Refillable bottles: These are 740 ml beer and cider bottles usually amber or green in color and sometimes called proprietary bottles. In addition, the 375 ml stubbie bottle has appeared recently on the market. Each bottle has a trade mark embossed on it to identify it with the brewer.

Refundable deposit bottles: Deposit bottles are white and have a logo printed with the filler's symbol. A 240 ml bottle carries a \$.10 deposit, while a 1 litre bottle carries a \$.20 deposit. Coca Cola, Cascade Cordials and Cadbury-Schweppes are the 3 main distributors of deposit bottles in the Hobart area. Coca Cola trades also under the names of Fanta, Leeds and Halls.

Non-refillables/non-returnables: Non-refillables are usually white in color. They are sometimes referred to as 'one-trip' bottles. They carry no deposit and are about 25% lighter in weight than the refillables. The non-refillables come in many sizes and have been the target of environmental groups like the Friends of the Earth as an example of wasteful extravagance in packaging (Branch, 1976). Such groups have cited the potential danger to the consumer and filler of injury due to "exploding carbonated drinks" because of the weaker design of the bottle (Anon-5, 1982). This is disputed by the manufacturer. In the USA in 1980, non-returnables comprised 6% of the domestic waste stream by weight (Seldman & Huls, 1982). In Australia, it was 9.2% (A.C.I. Community Services Department, 1981).

Glass Jars: The remainder of glass packaging is the common glass jar found in every supermarket. They are usually clear in color and come in a wide range of sizes.

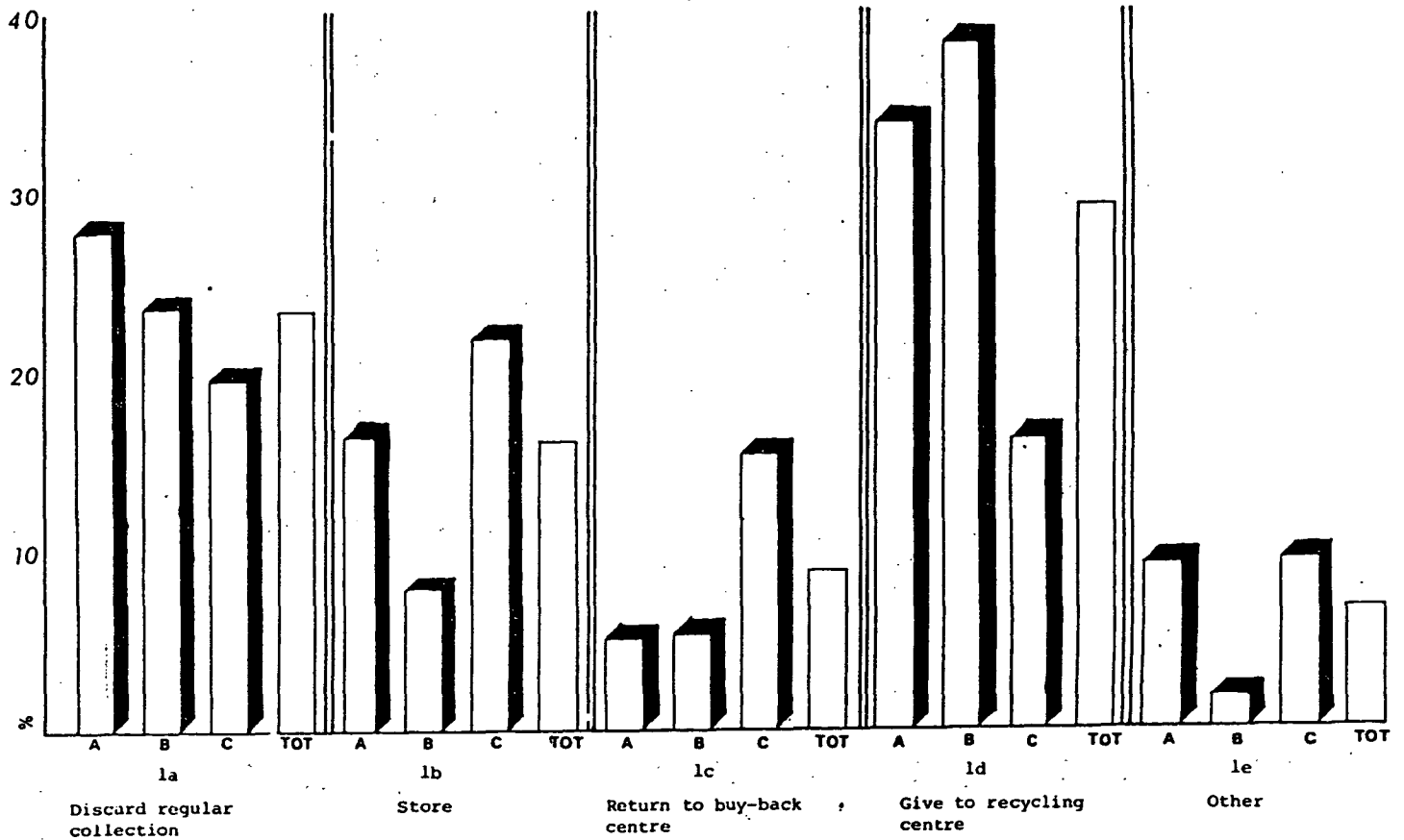
Rationale of Questions on Glass

Glass has been called the "most fully recyclable of all waste material packaging" (Harris, 1978; Stewart, 1986; Stoler, 1981). The reasons for focusing on glass as one of the 3 materials to be collected were that there is a tradition of glass being reused by industries; glass cullet has increased in quantity over the past 20 years; mining and transport costs for sand have increased the potential value of glass cullet (Dunn, 1984); glass is a bulky item in the waste stream; and the local industries are eager to reuse/recycle all the glass that they can.

Australia was second in the world after Switzerland in the recovery of glass waste (Burgin, 1979).

Figure 4.1

QUESTION1 DISCARDING of REFILLABLES



4.1.1 Results of Question 1 - Disposal of 'Refillable Beverage Bottles'

Five ways of disposing of refillables beverage bottles were identified. Only 23% said they discarded their refillables in the normal garbage collection. Twenty nine percent said they sent these bottles to a recycling centre and 16% stored them for collection by a community service group. Only a small number (9%) said they returned their refillables to a buy-back centre. The C Neighbourhood (38%) was less likely than A or B to discard refillables in the normal waste collection. Neighbourhood C tended to store the bottles and then return them to the Tasmanian Bottle Company for the fee of \$.30 per dozen. People in the B (38.3%) and A Neighbourhoods (33.7%) were more likely to give their refillables to a service group than those in C (16%). In the 'none purchased' category, B had the highest percentage of households which did not consume beer/cider - 23.5%, while C had 15.3% and A 8.2%.

TABLE 4-2

Results of Question One

QUESTION 1: How do you usually dispose of your "refillable" beverage bottles like beer and cider bottles?

	Neighbourhoods						Total	
	A. No.	%	B No.	%	C No.	%	No.	%
1a. Discard the bottles in your normal garbage collection	27	27.6	27	23.53	23	19.5	77	23.3
1b. Store them for future collection by a community service or charity group, inc. school bottle drive, Boy Scouts	16	16.3	9	7.8	28	23.7	53	16
1c. Return them to a buy-back centre. (Tas. Bottle Co.) Inc. Cascades, Bottler	5	5.1	6	5.2	18	15.3	29	8.8
1d. Give them to a Recycling Centre or Collection Depot	33	33.7	44	38.3	19	16.1	96	29
1e. Other - including tip, neighbour collects, make French drain, trash pack	9	9.2	2	1.7	11	9.3	22	6.7
SUB-TOTAL	90	91.9	88	76.5	99	83.9	277	83.8
None purchased	8	8.2	27	23.5	18	15.3	53	16
Not sure					1	0.9	1	0.3
TOTAL	98	100.1	115	100.0	118	100.0	331	100.0

4.1.2 Results of Question 2 - Disposal of 'Deposit' Beverage Bottles

Five main ways of disposing of deposit beverage bottles were identified. People were asked to say which of these methods they employed. More than half of Glenorchy householders surveyed (53%) said they returned deposit beverage bottles to a store for the refundable deposit. Only a small number (8%) said they discarded these bottles in the normal garbage collection, and 7% said they stored them for collection by a community service group. Twelve per cent of householders said they took them to a recycling collection centre.

Deposit bottles had the highest return rate of all refillable bottles, primarily because of the monetary incentive of the deposit. The deposit represented the value of the bottle to the filler. The trend in grocery retailing towards larger supermarkets and away from the corner store has acted to reduce the number of deposit bottles being sold. Most of the deposit bottles sold were through smaller take-away stores, country general stores, and service stations. The results of the questionnaire reflected this trend. One interviewer received several comments from residents that the retailers were not very keen to handle empty deposit bottles since storage space was at a premium.

In the B Neighbourhood, there was a strong tendency to give the deposit bottle to a recycling centre. The B Neighbourhood was more likely to move bottles quickly and was less inclined to store bottles for any period of time at home. This reflected the lack of storage space and/or the desire for a tidy yard or garage.

The overall 'loss' of deposit bottles in the normal garbage collection was 8.2%. This loss is explained because some householders did not know the difference between a deposit and non-deposit bottle and others could not be bothered to return their deposit bottles. Also a small percentage of deposit bottles get broken accidentally.

The A and C Neighbourhoods had almost twice the number of non-purchasers of deposit bottles as B. This is explained partially by Neighbourhood B having more older residents. It is hypothesized that they shopped more frequently, and also tended to shop at the smaller corner grocery stores within walking distance, while C and A residents shopped less frequently, but at the larger supermarkets which do not promote deposit bottles. This hypothesis needs further research.

FIGURE 4-2
QUESTION 2: Discarding of deposit bottles .

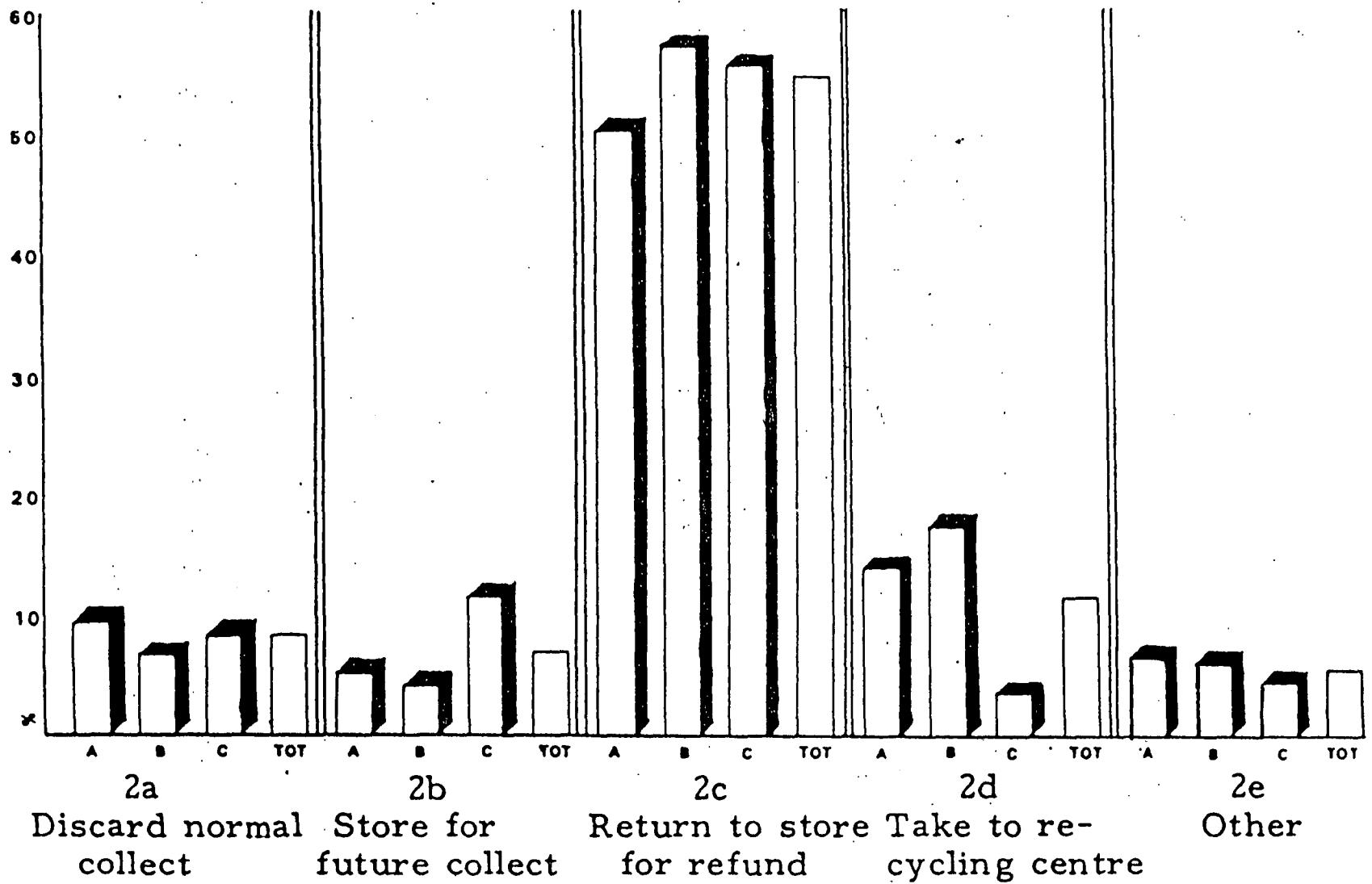


TABLE 4-3

Results of Question Two

QUESTION 2: There are other beverage bottles which are refillable and carry a refundable deposit. Many soft drink bottles carry a deposit. How do you usually dispose of your "deposit" beverage bottles?

	Neighbourhoods				Total			
	No. A	%	No. B	%	No. C	%	No.	%
2a. Discard the bottles in your normal garbage collection	9	9.7	8	6.9	9	8.1	26	8.2
2b. Store them for future collection by a community service or charitable group	5	5.4	5	4.4	13	11.7	23	7.2
2c. Return them to a store for the refundable deposit	47	50.5	66	57.4	62	55.9	175	54.9
2d. Take them to a Recycling Centre or Collection Group Depot	13	13.9	20	17.4	4	3.6	37	11.6
2e. Other	6	6.5	7	6.1	5	4.5	18	5.6
SUB-TOTAL	80	86.8	106	92.2	93	83.8	279	87.5
None purchased	13	14.0	9	7.8	18	16.2	40	12.5
TOTAL	93	100.0	115	100.0	111	100.0	319	100.0

4.1.3 Results of Question 3- Disposal of 'Non-Refillable' Beverage Bottles

Four ways were identified for the disposal of the 'non-refillable' bottle. People were asked to say which method they used. Overall, most householders (55%) discarded their non-refillables in the normal garbage collection. This 55% viewed the bottles as basically worthless or a nuisance. This was in contrast to the 55% who returned their deposit bottles for a refund. The monetary incentive was strong, but not as strong as was expected.

The B Neighbourhood generally did not store non-refillables, but tended to take them to a recycling centre. A fast turn-over of non-refillables was the norm for B possibly due to lack of storage space, smaller properties and a desire for tidiness. The A and C Neighbourhoods were more willing to store non-refillables for a future collection than the B Neighbourhood.

The penetration of the non-refillables into the Hobart market was indicated by the data. Only 4.7% overall said they did not purchase non-refillables. These overall figures were in sharp contrast to the 13.5% who said they did not purchase refillables. It appears that the retail packaging industry has been successful in its attempt to change the image of the one-trip bottle from 'non-refillable', to 'non refillable but recyclable' bottle. The packaging industry has promoted the one-tripper as an acceptable product which can be recycled by reclaiming the cullet. To this end, A.C.I. opened 3 bottle banks in Tasmania in 1984. (Bottle banks are drop-off centres where bottles can be returned to processors). The larger supermarket trend in retailing has hastened the market penetration of the one-tripper (Little, 1983).

FIGURE 4-3
QUESTION 3: Discarding of non-refillables.

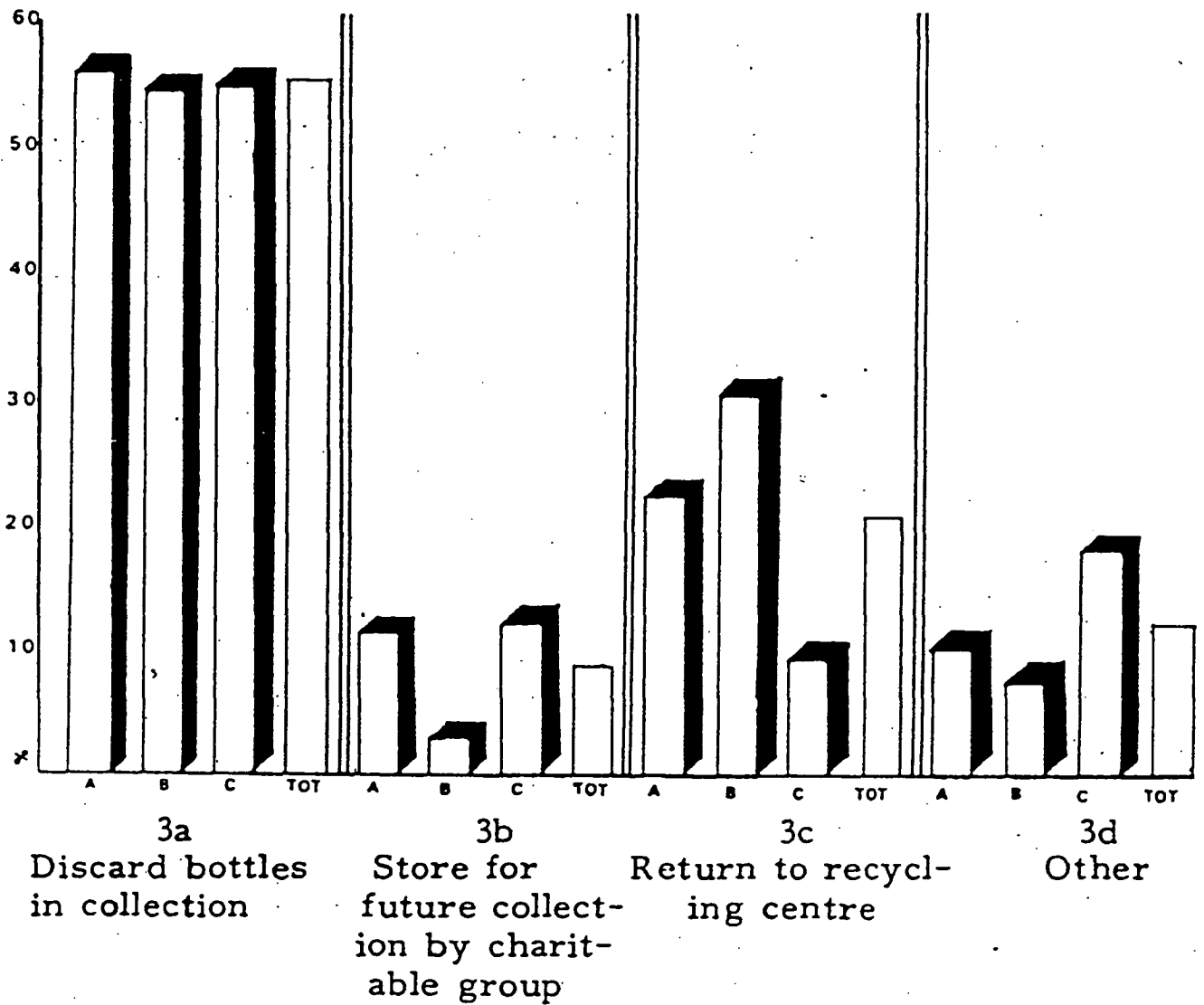


TABLE 4-4

Results of Question Three

QUESTION 3: Some glass beverage bottles are not designed by the manufacturers to be refilled.
How do you usually dispose of your "non-refillable" beverage bottles?

	Neighbourhoods							
	A		B		C		Total	
	No.	%	No.	%	No.	%	No.	%
3a. Discard the bottles in your normal collection	52	55.9	62	54.4	61	54.9	175	55.0
3b. Store them for future collection by a community service or charitable group	10	10.8	3	2.6	13	11.7	26	8.2
3c. Take them to a re-cycling centre.	20	21.5	34	29.8	10	9.0	64	20.1
3d. Other	9	9.7	8	7.0	20	18.0	37	11.6
SUB-TOTAL	91	97.9	107	93.8	104	83.6	302	94.9
None purchased	2	2.2	6	5.3	7	6.3	15	4.7
Not sure			1	0.9			1	2.31
TOTAL	93	100.0	114	100.0	111	100.0	318	100.0

4.1.4 Results of Question 4 - Disposal of Glass Jars

Three ways of disposing of glass jars were identified. People indicated which of these they used. Only 3.7% of the interviewed residents overall said they did not purchase glass jars. This was surprising in that it is extremely difficult to avoid totally purchasing some food products in a glass jar. In the Neighbourhood B, there was a surprisingly high 6.4% of non-purchasers. Neighbourhood C had 4%. Everyone in Neighbourhood A said they purchased glass jars.

Glass jars were reused by 60% of the householders for other domestic purposes. This showed the multi-purpose function of the glass jar for uses such as home preserving of jams, the storage of nails, pot plants, honey, paints and handicraft materials.

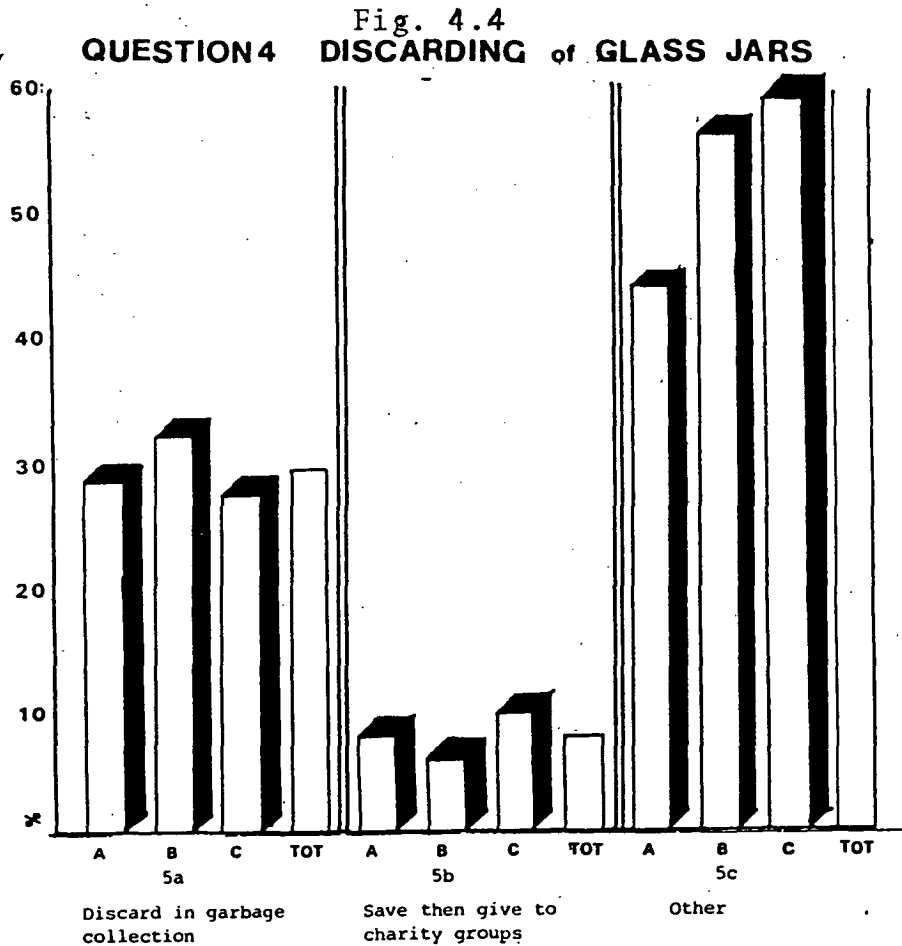


TABLE 4.5

Results of Question Four

QUESTION 4: How do you usually dispose of glass jars?

	Neighbourhoods							
	No.	A %	No.	B %	No.	C %	Total No.	%
4a. Discard them in the normal garbage collection	30	28.6	40	32.0	34	27.4	104	29.4
4b. Save them and give them to a charitable group	8	7.6	7	5.6	12	9.7	27	7.6
4c. Other	67	43.8	70	56	73	58.9	210	59.3
SUB-TOTAL	105	100.0	117	93.6	119	96	341	96.3
None purchased	0	0	8	6.4	5	4	13	3.7
TOTAL	105	100.0	125	100.0	124	100.0	354	100.0

4.2 QUESTION FIVE - DISPOSAL OF PAPER WASTE

Paper waste was the bulkiest item in the waste stream. However, it is relatively easy to separate, but heavy to move and store. Paper waste was defined as all paper discarded in the normal garbage at the household source. This definition was for purposes of the paper waste component in the Glenorchy Waste Compositional Analysis (Environmental Action Foundation, 1977).

The recyclable paper waste was all the uncontaminated (unmixed with other refuse) paper such as newspaper, magazines, books, cardboard boxes, photocopier printouts, paper bags, paper packaging, and stationery. From the author's personal observation, the bulk of paper waste actually set out for collection was newspaper and magazines.

4.2.1 Rationale

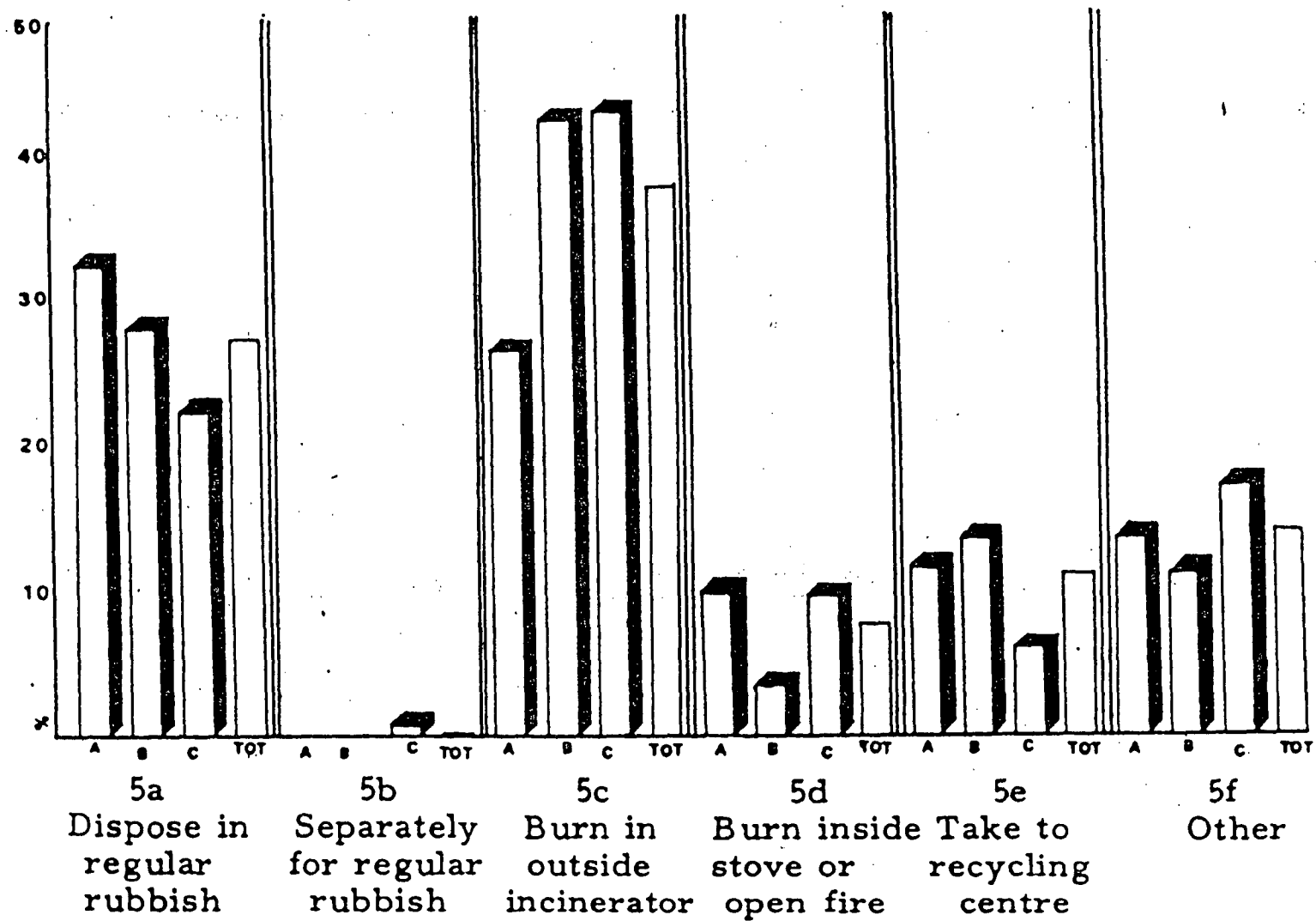
Paper made up 20% of the waste stream by weight as calculated by the Glenorchy Waste Compositional Analysis. (See Chapter 6) In Tasmania, despite the freight equalization scheme which is a Federal Government subsidy to assist the transport of Tasmanian products across the Bass Strait, disadvantages exist for exporters of paper waste to the mainland. Some of these disadvantages were the necessity to arrange shipping well in advance; the cost of shipping; and the limited options for markets in Melbourne. Historically, paper has been shipped to A.P.M. and Smorgans Pty. Ltd., two paper processors in Melbourne, Victoria. The Tasmanian charitable groups used 8 to 10 tonne containers provided by Sea Pak or Hammond Palmer to ship the paper waste.

St. Vincent de Paul sold its paper to A.P.M. for \$23 per tonne until October, 1982. However, with the downturn in the economy in late 1982, A.P.M. stopped purchasing paper from St. Vincent de Paul and most other charitable groups in Tasmania. This could have ended paper recovery projects in Tasmania. However, new local markets were found by the author. The two new purchasers were the Charlie Fluff Cellulose Insulation Company and Comfortseal Insulation Company. Charlie Fluff (based in Launceston) marketed its insulation Tasmania-wide. Comfortseal, a much smaller operation, served only the Hobart region.

Charlie Fluff agreed to pick up the baled paper from St. Vincent de Paul's warehouse once per week for their return trip to Launceston. Charlie Fluff found this arrangement satisfactory and paid \$25 per tonne. Comfortseal, with its smaller demand for paper and seasonal operation, paid \$35 a tonne. With the glut of paper on the world market in 1984/85, the local market's price dropped to \$20 per tonne. The drop in the price for paper waste helped influence the management of St. Vincent de Paul to end the recycling project.

FIGURE 4-5

QUESTION 5: Discarding of paper waste.



4.2.2 Results of Question 5 - Paper Waste

Six methods of disposing of paper waste were identified (Australian Paper Manufacturers, 1973; Hertzberg, 1985; Packaging Council of Australia - 2, 1979). Householders were asked to specify which method they used and the results are given below. Most householders in Glenorchy's 3 test neighbourhoods (38.8%) used the outside incinerator as their preferred method of disposing of their paper waste. This practice was common in all 3 neighbourhoods. It was most prevalent in C and B Neighbourhoods. The negative impacts of outside burning are: increased air pollution; soiled laundry on wash lines; increased breathing problems for people with allergies/asthma and increased fire hazards. The possible benefits are: reduction of the volume of domestic waste; reduction of need for extra trips to the landfill with consequent fuel savings; and as a recreational pursuit.

In the C Neighbourhood, 43.3% said they used the outside incinerator for waste disposal. The A Neighbourhood recorded only 29.1%, while the B was close to the C with 42.7%.

Of those surveyed, 27.4% of Glenorchy householders disposed of their paper waste in the normal garbage, which was the second-most favored method of disposal. This method of disposal required the least thought on the part of the householder. However, with the extra bulk of paper waste, the 2 bag/can limit could have been exceeded. This could have meant that the householder would have needed to find other means of disposal.

The category of 'other' uses produced some interesting responses. Residents reported that they made use of their paper waste for wrapping vegetables; pets' 'litter'; the warming of pigs in cold weather; car bodywork bordering; mulching and composting; swapping of magazines with neighbours; and craftwork. Overall, 14.1% of the households surveyed used paper waste for 'other' uses. In the C Neighbourhood, 17.2% found 'other' uses for their paper which was the highest total in the 3 neighbourhoods (Mamers, 1979).

Only 11.1% of the people in the 3 surveyed Glenorchy neighbourhoods indicated that they separated and took their paper waste to a recycling centre. These 11% could be considered the hard core paper recyclers.

The 4th category for disposing of paper waste was by burning it in an open fireplace or wood stove. Only 7.8% used the fireplace/stove for paper waste disposal. The highest rates were in the A and C Neighbourhoods, averaging about 10% each. There were several other factors in relation to the relatively low percentage (7.8%) who reported using a fireplace/stove as their chief disposal method.

First, while Australian Bureau of Statistics' figures recorded in 1979 showed 25% of the households in the Hobart metropolitan area used a fireplace/stove as the chief source of space heating, Glenorchy's 3 surveyed neighbourhoods were atypical and well below the average. Second, since this survey in 1981, a significant increase in the use of fireplaces/stoves has occurred. Third, a significant number of survey respondents has fireplaces/stoves but handled their paper waste in one of the other methods described.

This would suggest a large majority (92%) still use oil/gas/electric for their space heating needs. The overall trend to open fires/stoves has been slower to be implemented in Glenorchy than the rest of the Hobart metropolitan area.

TABLE 4-6

Results of Question Five

QUESTION 5: How do you usually dispose of your paper waste, like newspapers and magazines?

	Neighbourhoods							
	A		B		C		Total	
	No.	%	No.	%	No.	%	No.	%
5a. Dispose of it with the regular rubbish	36	32.7	33	28.2	30	22.4	99	27.4
5b. Put out separately for regular garbage collection	0	0	0	0	1	0.8	1	0.27
5c. Burn it in an outside incinerator	32	29.1	50	42.7	58	43.3	140	38.8
5d. Burn it inside, either in open fire or wood stove	11	10.0	4	3.4	13	9.7	28	7.8
5e. Separate and take the paper to a recycling centre	16	11.5	16	13.7	8	5.9	40	11.1
5f. Other	15	13.6	13	11.1	23	17.2	51	14.1
SUB-TOTAL	110	99.9	116	99.1	133	99.3	359	99.5
None purchased			1	0.09	1	0.8	2	0.55
TOTAL	110	99.9	117	100.0	134	100.1	361	100.05

4.3 QUESTION 6 - DISPOSAL OF ALUMINIUM CANS

4.3.1 Definition

The aluminium can is a thin, crushable, 370 ml drink container which is lighter than the more common steel can. The aluminium can is made from the common metal of aluminium found in the earth's crust (Begg, 1981). Most aluminium is processed from bauxite to alumina to the primary metal of aluminium before being alloyed with manganese and magnesium in the production of a beverage can (Lawrie, 1981). For the purposes of the study, the 370 ml aluminium can was the focus of discussion (Thompson, 1986).

4.3.2 Rationale

Aluminium beverage cans are produced at high energy inputs. The metal retains its basic qualities after remelting many times over (Thompson, 1986). Because of the low metal loss during the remelting process, aluminium is valuable for secondary uses. There is a relatively low energy cost for remelting, estimated to be only 5% of the energy required for the initial smelting of the primary metal. The growing availability of low-cost recycled aluminium for reuse in markets currently using higher cost materials, together with the increase in use of aluminium products worldwide, has stimulated the incidence of recycling aluminium waste for further uses (Lawrie, 1982).

As Table 4-7 shows, if a 370 ml aluminium can is recycled, it represents the 'lowest' consumption of energy. This assumes about 50% of aluminium cans are recycled in Australia. The average energy cost of making an aluminium can from virgin material is 7.6 MJ. Aluminium cans could be made for an average of 4.3 MJ if virgin materials were combined with equal amounts of recycled aluminium. This is about the same energy cost of the non-returnable glass bottle.

The cost of collection, transport, and resale of aluminium cans to the industry must be considered (Thompson, 1986; Papke & Roumpf, 1985). In 1981, Tasmania had 32 can collection centres which had been set up by Comalco. Comalco estimated that 67 tonnes or 32 million cans were returned to Bell Bay for remelting in 1981 (Beard, 1984). This represented an average rate of 7.1 cans per person in Tasmania (Anon 2, 1981). Much of this activity was centred in the north of Tasmania. The price of one kilogram of aluminium dropped from \$.45 to \$.35 in 1982, but rose again to \$.45 in 1983. This fluctuation caused concern to the collectors like the Self Help Sheltered Workshops who crush and pack the cans into 1 metre squares before transporting them to Bell Bay.

The reasons for including aluminium cans as the third item to be collected were; the intrinsic value of the metal, the importance of encouraging the individual resident to see the

aluminium cans recycled, and the established system for selling to a Tasmanian company without needing to cross the Bass Strait (Comalco, 1978).

TABLE 4-7 ENERGY COSTS IN THE PRODUCTION OF CONTAINERS

370 ml alum cans, virgin materials	- 7.6 MJ
370 ml steel cans, alum top, virgin materials	- 5.0 MJ
370 ml non-returnable bottle, virgin materials	- 4.6 MJ
370 ml non-returnable bottle, recycled glass	- 4.6 MJ
370 ml steel can, alum top, recycled steel	- 3.0 MJ
370 ml refillable bottles, 5 trips	- 2.8 MJ
<u>370 ml alum can recycled aluminium</u>	<u>- 2.0 MJ</u>

Source: (Australian Environmental Council, 1979)

4.3.3 Results of Question 6 - Aluminium Cans

Three ways of disposing of aluminium cans were identified. Of those surveyed, 69.9% of Glenorchy householders disposed of their aluminium cans in the regular garbage. Very few residents bothered giving them to a recycling centre. In the C Neighbourhood, no respondent reported returning aluminium cans to a recycling centre. In Neighbourhood A and B, it was about 3% who said they took their cans to a buy back centre.

The category of 'none purchased' was 26.7% overall. This large percentage of households not purchasing aluminium cans coincided with the limited penetration of the aluminium can into the southern Tasmanian market.

FIGURE 4-6

QUESTION 6: Discarding of aluminium cans

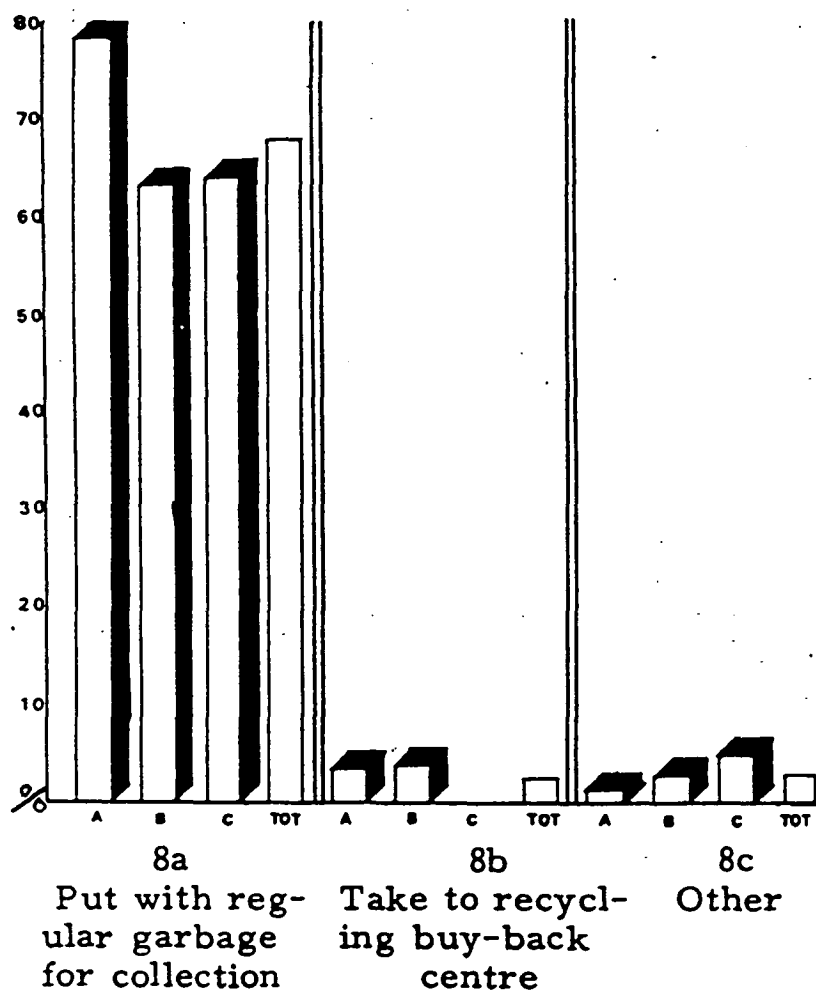


TABLE 4-8

Results of Question Six

QUESTION 6: How do you usually dispose of your empty aluminium cans?

	Neighbourhoods							
	A		B		C		Total	
	No.	%	No.	%	No.	%	No.	%
6a. Put them in with other garbage for regular collection	72	78.3	70	63.1	69	63.9	211	67.9
6b. Separate them and take them to a Recycling Buy Back Centre	3	3.3	4	3.6	0	0	7	2.3
6c. Other	1	1.11	3	2.7	5	4.6	9	2.9
SUB-TOTAL	76	82.7	77	69.4	74	68.5	227	73.1
None purchased	16	17.4	34	30.6	33	31	83	26.7
No answer	0	0	0	0	1	0.9	1	0.3
TOTAL	92	100.1	111	100.0	108	100.4	311	100.1

4.4 QUESTION 7 - DEPOSIT LEGISLATION

4.4.1 Rationale

Since 1977 when the South Australian Labor Government first passed legislation to require deposits on beverage containers (DeBelle, 1983), the other Australian states have watched closely to see if the desired effects would be achieved. Environmental groups like the Friends of the Earth have lobbied strongly to introduce similar legislation in Victoria and New South Wales. This debate has continued to attract attention in the local Tasmanian press with letters to the editor. The argument is that deposit legislation provides the necessary financial incentive to insure a large percentage of containers is recycled while reducing the litter stream. In NSW, a 5 year moratorium on the subject has been called since the Litter Research Association aims to use the \$700 000 contributed by industry to fight pollution (Perrett, 1983).

Historically, the Keep Australia Beautiful campaign has been supported by the beverage container manufacturers. They argue that compulsory deposits are counter productive in that more energy is consumed in the handling, processing, cleaning and drying of refillables than in manufacturing of new cans and bottles. Their main arguments were that deposit legislation would cause:

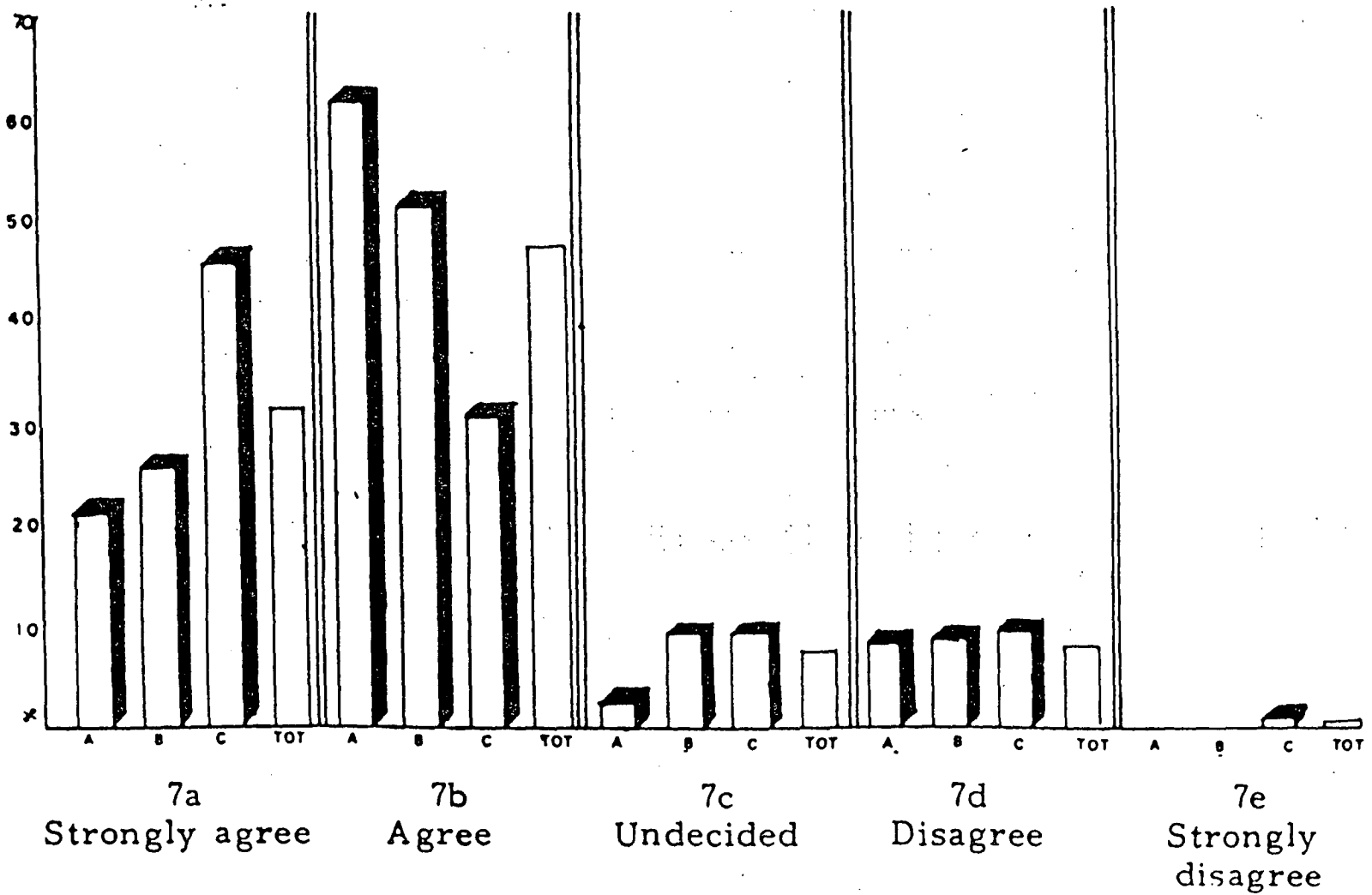
1. price increases and a decline in beer and soft drink sales;
2. would impact negatively Tasmanian industry as the multiplier effect would be felt in the related agricultural, confectionery, and other food processing industries;
3. would create hardship and inconvenience for individuals required to return their bottles;
4. would add costs to retail operations as there would be more space needed for storage with more handling costs; and
5. would reduce littering very little.

According to Sherlock, Tasmanian director of the Keep Tasmania Beautiful Council, the 4 Es' campaign of Education, Enforcement, Equipment and Example for Tasmania as put forth by the Keep South Australia Beautiful Council contributed just as significantly to the apparent success in South Australia in reducing littering as did deposit legislation (Sherlock, 1981; Municipal Association of Tasmania, undated).

In Tasmania, deposit legislation has not been enacted by either the Labor or Liberal governments. In 1982, Geoff Pearsall, Tasmanian Minister for the Environment, stated that the Robin Gray Liberal government, would not enact deposit legislation. The

FIGURE 4-7

QUESTION 7: Deposit legislation.



reason given was the potential loss of jobs (Joustra, 1982).

In the USA, various states have enacted deposit legislation for beverage containers. Of these, Oregon is the best known for its early and influential decision to pass deposit legislation in order to reduce litter and promote recycling (Australian Broadcast Corporation, 1982). By contrast, can and bottle manufacturers and distributors have been opposed to deposit legislation.

In 1972, Charles E. F. Millard, president of Coca Cola of New York, said that he was unconvinced that a higher monetary incentive would change people's habits. He cited as an example the decision by his company to raise the deposit from 2 cents to 5 cents in 1971, resulting in a temporary increase in the number of bottles redeemed, which soon dropped back to the point where fewer total bottles were returned (Bird, 1972).

Eight years later, the State of Connecticut passed a Bottle law in 1980 (Wald, 1982). It has produced mixed results. Very similar arguments like loss of jobs, a glut of materials, a burden on shopkeepers and price increases were used against deposit legislation by Connecticut manufacturers and retailers. However, the manufacturers and retailers have adjusted to the concept of returning the used bottles to the supermarket or redemption centre. The middlemen have been the obvious winners, as they have started their own small businesses based on collecting the bottles from the stores and returning them to the distributors. There has also been a surge in the usage of the plastic PET container, usually at least 1 litre in size. These large plastic bottles are lighter and easier to handle (Baum & Parker, 1974). They are returned, shredded, and discarded, thus defeating the purpose of the legislation to recover waste materials. The other negative aspects have been the relative inconvenience to the consumers and retailers who have complained about the extra handling cost, added untidiness in and around the stores, and the price increases. On the positive side, there has been an increase in bottle and can recovery, a marked decrease in litter, the creation of new enterprises for the middlemen, and an increase in the life of landfills.

TABLE 4-9

Results of Question Seven

QUESTION 7: In order to encourage recycling and to reduce litter, some laws require refundable deposits on all beverages sold. Often these deposits mean a slightly higher price for beverages.

Do you feel that such a law would be a good thing for Glenorchy?

	Neighbourhoods							
	No.	A %	No.	B %	No.	C %	Total No.	Total %
7a. Strongly agree	19	20.9	29	25.9	51	46.4	99	31.6
7b. Agree	57	62.7	58	51.8	34	30.9	149	47.7
7c. Undecided	2	2.2	10	9.0	10	9.0	22	7.1
7d. Disagree	7	7.7	9	8.1	10	9.1	26	8.3
7e. Strongly disagree	0	0	0	0	1	0.9	1	0.3
SUB-TOTAL	85	93.5	106	94.8	106	96.4	297	95.0
As it is	4	4.4	0	0	0	0	4	1.3
No answer	2	2.2	6	5.4	4	3.6	12	3.8
TOTAL	91	100.0	112	100.0	110	100.0	313	100.0

exceeded the limit occasionally. The bulky items like newspapers, bottles, cans and garden cuttings tended to be the items which were separated out and taken to the landfill individually.

This question attempted to quantify the number and cost of extra trips made by residents to the landfill.

4.5.2 Results of Question 8 - Personal Excess Trips To the Tip

Visiting the landfill frequently was cited as common occurrence in Glenorchy. The largest number, 16.5%, lived in the A Neighbourhood. More than half of all residents in Neighbourhood A, 56%, visited the landfill. However, a fairly high number of householders in Neighbourhood B (18%) said they never visited the landfill. Elsewhere, it is shown that there were more pensioners and elderly people living in this Neighbourhood B. These people may have been less able to make such visits or have less access to trailers to cart rubbish. Also because they had smaller properties, they may not have generated sufficient quantities of garden waste to warrant a trip to the tip.

FIGURE 4-8
QUESTION 8: Excess trips to the tip.

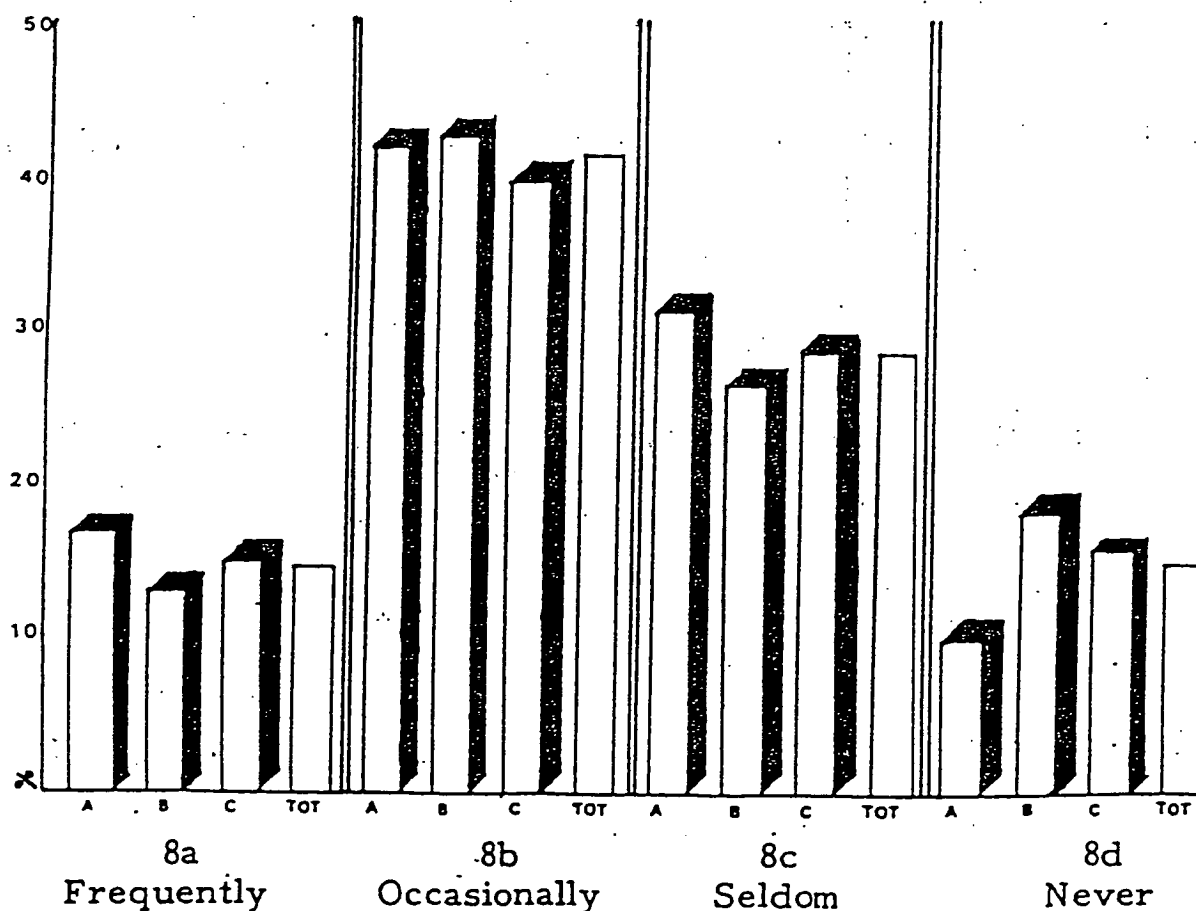


TABLE 4-10

Results of Question Eight

QUESTION 8: How often do you make a trip to the tip because of excess rubbish?

	Neighbourhoods							
	A		B		C		Total	
	No.	%	No.	%	No.	%	No.	%
8a. Frequently (once per week)	15	16.5	14	12.6	16	14.7	45	14.5
8b. Occasionally (once every two months)	38	41.8	47	42.3	43	39.5	128	41.2
8c. Seldom (once per year)	28	30.8	29	26.1	31	28.4	88	28.3
8d. Never	9	9.9	20	18.0	17	15.6	46	14.8
SUB-TOTAL	90	99.0	110	99.0	107	98.2	307	98.8
No answer	1	1.1	1	0.9	1	0.9	3	1.0
Trash pack	0	0	0	0	1	0.9	1	0.3
TOTAL	91	100.0	110	100.0	109	100.0	311	100.0

4.6 QUESTION 9 - DISPOSAL OF FOOD WASTES

4.6.1 Rationale

This question aimed to ascertain the present disposal pattern of food wastes. Food waste comprised about 50% by weight of the domestic waste stream in Glenorchy, as calculated in the Glenorchy Waste Compositional Analysis. The food/organic waste component is potentially a valuable product as a soil conditioner. However, collection of food wastes is a tricky, messy and smelly business. For these reasons, it was decided early in the project's planning phase not to collect food wastes for recycling.

4.6.2 Results

The data showed that overall, 43.9% of the residents said they discarded their food wastes in the normal garbage collection. Neighbourhood A had both the highest percentage of residents (53%) who said they discarded their wastes in the normal garbage collection, as well as the second highest percentage (29.6%) who composted their food wastes.

Some of the reasons for residents discarding their food waste in the normal garbage collection were: the small daily amount generated; the necessity of storing the food wastes separately prior to reuse; lack of knowledge about the method and benefits of composting; the perceived limited space on the property for composting; inability to do the necessary gardening required because of age or illness; the fear of increasing fly and vermin populations; and the lack of interest. These reasons applied to all 3 neighbourhoods and were based on personal observations and discussions during the Questionnaire Survey.

In the C Neighbourhood, 24.5% of the residents said they fed the food scraps to the household pets. The reasons were that Neighbourhood C: is more rural in character; has more animals in the immediate vicinity; has larger properties and there was less concern about pets straying on to other properties.

The B (9%) and C (7.0%) Neighbourhoods had more chickens eating food scraps than Neighbourhood A's 4.4%. Chickens represented a source of cheap eggs and are a legacy of the early rural days of Glenorchy. However, the increasing urban expansion has reduced the number of residents keeping chickens significantly.

FIGURE 4-9
QUESTION 9: Discarding of food waste.

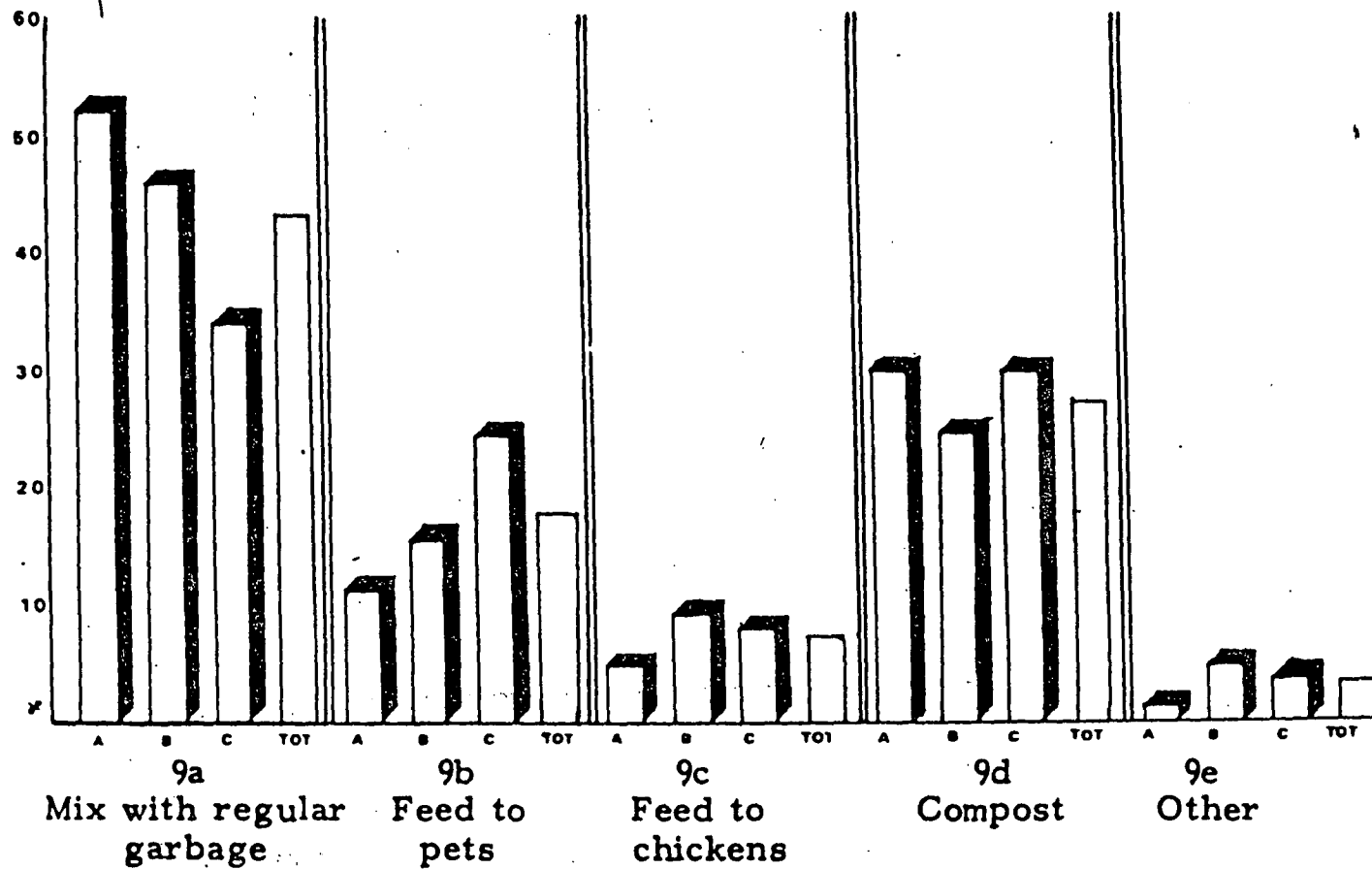


TABLE 4-11

Results of Question Nine

QUESTION 9: When you dispose of your food wastes, which of the following do you usually do?

	Neighbourhoods							
	A		B		C		Total	
	No.	%	No.	%	No.	%	No.	%
9a. Mix them with the other regular garbage	61	53.0	72	46.5	50	34.0	183	43.9
9b. Feed them to household pets	13	11.3	24	15.5	36	24.5	73	17.5
9c. Feed them to chickens	5	4.4	14	9.0	11	7.5	30	7.2
9d. Compost them	34	29.6	38	24.5	44	29.9	116	27.8
9e. Other	1	0.9	7	4.5	5	3.4	13	3.1
SUB-TOTAL	114	99.2	155	100.0	146	99.3	415	99.5
No answer	1	0.9	0	0	1	0.7	2	0.5
TOTAL	115	100.0	155	100.0	147	100.0	417	100.0

4.7 QUESTION 10 - WORTHWHILENESS OF SOURCE SEPARATION RECYCLING

4.7.1 Rationale

Much of the recycling literature suggests that the concept of recycling strikes a positive chord with most people (Harris, 1982). The literature also suggests that recycling has a greater attraction among the higher socioeconomic groups (Rathje et al, 1984; Stump, 1981). The support for recycling by the householder can be on several levels. First, it can be argued that recycling is desirable as a general concept. Second, recycling is considered a good concept as long as it does not cause inconvenience. Third, it is purported that recycling appeals mostly to young people. Fourth, recycling is deemed a desirable concept despite the extra inconvenience and the added personal involvement required.

The question attempted to find out if people thought recycling was worthwhile, even if they had to separate the recyclables. It also measured their intensity of feeling about the question.

Fig. 4-10

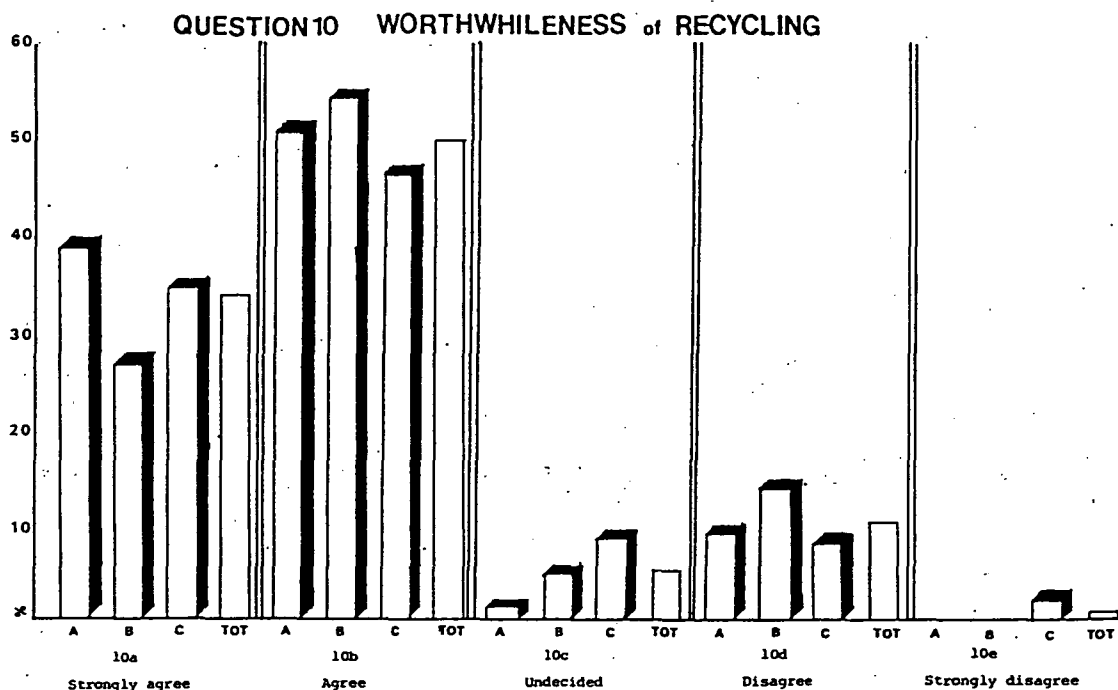


TABLE 4-12

Results of Question Ten

QUESTION 10: If some of your garbage could be usefully recycled, but to be economically feasible you would have to separate those items from the regular garbage, do you agree that it would be worthwhile to do so?

	Neighbourhoods							
	No.	A %	No.	B %	No.	C %	Total No.	%
10a. Strongly agree.	35	38.5	29	26.1	37	34.3	101	33.6
10b. Agree	46	50.6	60	54.1	50	46.3	156	50.3
10c. Undecided	1	1.1	5	4.5	9	8.3	15	4.8
10d. Disagree	8	8.8	15	13.5	8	7.4	31	10.0
10e. Strongly disagree	0	0	0	0	2	1.9	2	0.7
SUB-TOTAL	90	99.0	109	98.2	106	98.2	305	99.4
No' answer	1	1.1	2	1.8	2	1.9	5	1.6
TOTAL	91	100.0	111	100.0	108	100.0	310	100.0

4.7.2 Results of Question 10 - Worthwhileness of Source Separation Recycling

Of those surveyed, 83.9% perceived source separation recycling as a worthwhile concept even with the personal requirement of separating items from the waste stream to make it economically feasible. When combining the categories of strongly agrees and agrees, it showed that Neighbourhood A registered a percentage of 98.1%, B 80.2%, and the C Neighbourhood 80.6%. This supported the concept that the higher the socioeconomic level, the more positive the response to recycling would be.

The highest percentage of disagreement about the worthwhileness of recycling was in the Neighbourhood B with 13.%. This may have been that Neighbourhood B had the largest percentage of older people and the smallest average number of persons in the family unit; and/or the residents assumed their small amount of recyclables would be inconsequential.

The results of Question 10 suggested that a source separation recycling project would have a good chance of success in all three neighbourhoods, if 83.9% (those which agreed on the worthwhileness of recycling) participated in a weekly recycling project. However, human nature being what it is, the actual participation rates were considerably less than 83.9%. For example the average participation rates for the contacted group in Neighbourhood A was only 12.8% overall. (See Table 7-4-9) Surveys do not discover what people will do, but only what they say they will do.

4.8 HOUSEHOLD PROFILES - QUESTIONS 11 THROUGH 14

Questions 11 to 14 were included in the questionnaire to develop a socioeconomic profile of the 3 neighbourhoods. While it was appreciated that many people object to "personal" matters being canvassed, the nature of the study required data on the 3 neighbourhoods in order to compare the data of the 1976 census.

4.8.1 Rationale for Questions 11 through 14

Four main measures were used to construct neighbourhood socioeconomic profiles. These were: (1) the number and age of the persons in a household; (2) the educational attainment of the householders; (3) the occupation of the householders; and (4) the annual household income.

The number and ages of persons in a household are important factors in the potential waste generation of the household (Alter, 1983). Survey information provided a measure of the average number of persons per household in each neighbourhood and the number of persons under 18 years of age. This gave a check against such data available from the 1976 census.

4.8.2 Results of Question 11 - Part 1 - Number of Residents; Part 2 - Number under 18 years of Age

Table 4-13 depicts the results of the surveyed households in Glenorchy. These data were used to compare the 1976 census data with the surveyed results. Section 3.3 described the 1976 census figures. The surveyed figures of Table 4-13, showed neighbourhood B had a mix of younger families with children under 18 and older families with no children under 18 years of age. These data confirmed that Neighbourhood C had the most persons per household. Neighbourhood A had a little over 3 persons per household, while Neighbourhood B had fewer than 3 persons per household.

TABLE 4-13
Results of Question Eleven - Household Data of Three Neighbourhoods
Surveyed in Glenorchy, Tasmania

	Neighbourhood		
	A	B	C
Total Number of Persons in Households	270	303	389
Total Number of Households Surveyed	89	108	107
Average Number of Persons per Household	3.03	2.81	3.64
Total Number of Persons Under 18 Years	70	113	136
Total Number of Households with Persons Under 18 Years	38	34	60
Average Number of Persons Under 18 Years in Those Households with Persons Under 18 Years	2.34	3.32	2.27

4.8.3 Results of Question 12 - The Level of Education

Table 4-14 shows 6 levels of educational attainment for the surveyed householders. Some 67% of all residents said they had completed an education up to Leaving Certificate level (Grade 10).

Only 5.6% of the C Neighbourhood said they undertook matriculation studies compared to 10.7% in B and 15.9% in A. Also, only about 6% of residents in both B and C Neighbourhoods had tertiary qualifications compared with the 11% in A. Over 23% of those surveyed in Neighbourhood A declined to state their educational attainments.

TABLE 4-14

Results of Question Twelve

QUESTION 12: Please indicate the level of education you and the other adults in your household have completed.

Neighbourhood	A				B				C					
	Inter- viewed	Other Adults	Total	%	Inter- viewed	Other Adults	Total	%	Inter- viewed	Other Adults	Total	%	Total	%
a. Primary grades	1	1	2	0.9	13	11	24	10.3	11	8	19	8.2	45	6.6
b. Left school before Grade 10	6	11	17	7.7	30	13	43	18.5	14	13	27	11.6	87	12.7
c. Completed High School (Grade 10)	37	33	70	31.8	32	42	74	31.8	43	64	107	45.9	251	36.6
d. Completed Grade 11 or 12	14	21	35	15.9	9	16	25	10.7	4	9	13	5.6	73	10.6
e. Technical College or Trade Apprentice	7	15	22	10.0	23	21	44	18.9	13	14	27	11.6	93	13.5
f. Tertiary College/ University	13	11	24	10.9	5	8	13	5.6	7	7	14	6.0	51	7.4
No Answer	12	38	50	22.7	7	3	10	4.3	11	15	26	11.2	86	12.5
TOTAL	90	130	220	99.9	119	114	233	100.1	103	130	233	100.0	686	99.0

4.8.4 Results of Question 13 - Occupation

Only 1.6% of the sampled householders said they were unemployed; 17.5% were aged pensioners; 3.5% were students, and 10.4% declined to answer. Another 40% of the population were in paid employment. Half these workers were blue collar and the other half were white collar workers. A similar sized group (21%) was occupied in home duties.

Neighbourhood A had almost twice the number of white collar workers (30.7%) compared to B's (16.4%). The C Neighbourhood had more white collar workers (19.2%) than Neighbourhood B. This variation arose because of the high incidence of aged pensioners (24%) in the B Neighbourhood.

The C Neighbourhood had the highest % of blue collar workers (24.7%), followed by B with 20% and A with 18.3%.

If the blue and white collar employment percentages are combined, the Neighbourhood A had an employment rate of 49%, C 43.9% and B 36.4%. The implications were that the employment rate was higher in A than the other 2 neighbourhoods. Unemployment was found to be low in all 3 neighbourhoods. Comparing state and national figures of 1981/82, the average expected unemployment range would have been between 7 to 9%. However, because of the low percentage in all three neighbourhoods, unemployment overall was less than 2 per cent.

TABLE 4-15

Results of Question Thirteen

QUESTION 13: Occupation

	A				B				C				Total Total	Total %
	Inter- viewed	Other Adults	Total	%	Inter- viewed	Other Adults	Total	%	Inter- viewed	Other Adults	Total	%		
Blue collar workers	19	21	40	18.3	18	27	45	20.0	32	27	59	24.7	144	20.8
White collar workers	36	31	67	30.7	14	23	37	16.4	19	27	46	19.2	150	21.7
Housewife- Househusband	17	23	40	18.3	28	23	51	22.7	19	25	44	18.4	145	21.0
Student	1	6	7	3.2	2	7	9	4.0	3	5	8	3.3	24	3.5
Unemployed	-	-	-	-	1	1	2	0.9	5	4	9	3.8	11	1.6
Social Security Beneficiary	0	0	0	0	2	2	4	1.8	1	1	2	0.8	6	0.9
Aged Pensioner	15	14	29	13.3	30	26	56	24.9	20	16	36	15.1	121	17.5
Other	-	1	1	0.5	3	9	12	5.3	1	5	6	2.5	19	2.8
No answer	1	33	34	15.6	4	5	9	4.0	8	21	29	12.1	72	10.4
TOTAL	89	129	218	99.9	102	123	225	100.0	108	131	239	99.9	692	100.2

4.8.5 Results of Question 14 - Annual Household Income

Table 4-16 shows the income levels of Glenorchy residents in 5 categories. Of all the questions asked on questionnaires, income questions are the most threatening to the majority of householders. This was confirmed with the high response rate in the "no answer" category, 27%.

In the A Neighbourhood, 6.7% said they had a household income over \$25 000 in 1981. The C Neighbourhood was close to Neighbourhood A's figure with 4.8% over the \$25 000 mark. This reflected 2 phenomena. First, white collar jobs do not pay much better than blue collar jobs. Second, because household income was calculated as the joint income of all persons in a household, the higher incomes in Neighbourhood C reflected a higher number of employed persons per household than in the Neighbourhood A.

The relatively large percentage of pensioners was reflected in the Neighbourhood B's income figures.

Socioeconomic characteristics can not be used directly in predicting the types or quantities of waste generation. For example, studies in Milwaukee, Wisconsin, suggested that a high income does not necessarily mean a greater generation of waste. The Milwaukee Garbage Project found that low income sampled households actually discarded more packaging of various types than middle income groups (Schmitt, 1981; Rathje & Thompson, 1981). The conclusion was that income levels/family size do not totally explain the quantity of solid waste generated. Rather, each city must be individually analyzed to measure waste generation.

TABLE 4-16

Annual Household Income

QUESTION 14: Could you Indicate Your Annual Household Income?

Neighbour- hoods	A		B		C		Total Number	Total %
	Household Number	%	Household Number	%	Household Number	%		
a. \$8000 or less	17	18.9	36	33.3	23	21.5	76	24.9
g b. \$8001 to \$15000	21	23.3	35	32.4	23	21.5	79	25.9
c. \$15000 to \$25000	16	17.8	18	16.7	22	20.6	56	18.4
d. Above \$25000	6	6.7	-	-	5	4.8	11	3.6
e. No answer	30	33.3	19	17.6	34	31.8	83	27.2
TOTAL	90	100.0	108	100.0	107	100.2	305	100.0

4.9 QUESTION 15 - THE MOST SERIOUS WASTE ISSUE FACING GLENORCHY

4.9.1 Rationale

This question was intended to give the interviewees an opportunity to express their concerns, grievances, and observations on any waste issue in Glenorchy. It was designed as an open-ended question to give the initiative to the respondent. The question was not intended to be restricted to solid waste, but to cover any waste issue which residents thought relevant.

4.9.2 Results

Table 4-17 shows 33 categories of responses made by Glenorchy residents in relation to waste issues. Only 7 of these were made by one person. Three or 4 persons making the same responses constituted 1% of the householders. There were 3 such issues which 5% of the total of Glenorchy residents felt were important: litter, cans, and junk mail. Newspapers and packaging were also of concern and some people mentioned the lack of recycling centres. These concerns were also cited in the writings of (Bates, 1987) in Tasmania and nationally by (McCrann, 1977) and the (Australian Environmental Council, 1982). However, 27% made no answer and a further 10% did not know of any problem or said there was no problem.

TABLE 4-17

Results of Question Fifteen

QUESTION 15: What do you think is the most serious waste issue facing the Glenorchy area today?

	Neighbourhoods								Total
	A		B		C				
	No.	%	No.	%	No.	%	No.	%	
1. No answer	27	27.0	39	35.0	27	21.0	93		27.1
2. Don't know	5	5.0	4	4.0	7	5.0	16		4.7
3. There is no problem	10	10.0	3	3.0	7	5.0	20		5.8
4. Litter, generally	6	6.0	16	14.0	14	11.0	36		10.5
5. Cans (beer, soda)	4	4.0	6	5.0	9	7.0	19		5.5
6. Bottles (beer, soda)	2	2.0	3	3.0	5	4.0	10		2.9
7. Paper (newspapers, packaging)	6	6.0	1	0.9	9	6.8	16		4.7
8. Too much waste generally	7	7.0	2	2.0	5	4.0	14		4.1
9. Junk mail	8	8.0	9	8.0	1	0.8	18		5.3
10. Too much food wasted	5	5.0	1	0.9	3	2.0	9		2.6
11. Water wasted on lawns/ washing machines	1	1.0	3	3.0	4	3.0	8		2.3
12. Need to inform people of the benefits of composting	1	1.0	4	4.0	4	3.0	9		2.6
13. Indiscriminate dumping of waste	4	4.0	2	2.0	-	-	6		1.8
14. Lack of recycling centres	2	2.0	4	4.0	5	4.0	11		3.2
15. Garbage collection service inadequate	2	2.0	-	-	9	7.0	11		3.2
16. Better use of vacant land	1	1.0	-	-	2	2.0	3		0.9
17. More garbage bins needed in shopping centres	2	2.0	-	-	3	2.0	5		1.5

18. Taxpayer's money wasted	2	2.0	4	4.0	-	-	6	1.8
19. Need access to tip	2	2.0	-	-	1	0.8	3	0.9
20. Need longer hours for the tip to be open to the public	-	-	1	0.9	1	0.8	2	0.6
21. Road cleaning machine necessary	1	1.0	-	-	-	-	1	0.3
22. Council doesn't mow lawns on public parks often enough	1	1.0	-	-	-	-	1	0.3
23. Unemployed manpower/woman-power wasted	-	-	1	0.9	-	-	1	0.3
24. Roadside workers wasting time	-	-	4	4.0	2	2.0	6	1.8
25. Wasting of power (electricity)	-	-	1	0.9	-	-	1	0.3
26. People throwing chewing gum and cigarette butts on footpath	-	-	2	2.0	-	-	2	0.6
27. Housing units need more storage space for garbage bins	-	-	1	0.9	1	0.8	2	0.6
28. The spilling of garbage on the roads/vandalism	-	-	2	2.0	1	0.8	3	0.9
29. Sewage odours/air pollution	-	-	-	-	1	0.8	1	0.3
30. Dogs/cats roaming freely in the community	-	-	-	-	6	5.0	6	1.8
31. Tip filling up too fast	-	-	-	-	2	2.0	2	0.6
32. Plastics, too much and not properly disposed of	-	-	-	-	1	0.8	1	0.3
33. Too much sawmill waste at the tip	-	-	-	-	1	0.8	1	0.3
TOTAL	99	99.0	113	102.4	131	102.2	343	100.1

4.10 QUESTION 16 - WILLINGNESS TO PARTICIPATE IN THE RECYCLING PROJECT

4.10.1 Rationale

The last question was intended to measure the residents' willingness to participate in a recycling project. From the responses of Yes, Maybe, and No, a data base was established for further record keeping of residents' actual participation rates. If the householders said they did not wish to answer the questionnaire after reading the introductory letter, they were asked if they would participate in the recycling project.

4.10.2 Results

Table 4-18 gives the results of this question. The data are shown in relationship to the householders willingness to fill in the questionnaire. This meant some separate entries in the Table 4-18 had to be summed to derive the answer to willingness to participate in the Project. Of those surveyed, 64.6% of householders in the three neighbourhoods said they would participate in the recycling Project. On the negative side, 22.2% overall stated that they would not participate in the recycling Project. In Chapter 7, there is a discussion of the results of the 6 groupings of contacted households.

Chapter 5 details the first Tasmanian Waste Compositional Analysis.

TABLE 4-18

Householder's initial response to participate in a source separation project

	Neighbourhoods						Total	
	A		B		C			
	No.	%	No.	%	No.	%	No.	%
Yes/Yes*	69	62.7	70	56.0	66	58.9	205	59.1
No/Yes	10	9.1	5	4.0	4	3.6	19	5.5
Yes/Maybe	8	7.3	12	9.6	25	22.3	45	13.0
No/Maybe	1	0.9	0	0	0	0	1	0.3
Yes/No	11	10.0	22	17.6	12	10.7	45	13.0
No/No	11	10.0	16	12.8	5	4.5	32	9.2
TOTAL	110	100.0	125	100.0	112	100.0	347	100.0

* EXAMPLE YES/YES - The first yes means that the respondent agreed to fill out the questionnaire, and the second yes means they will participate in the project.

5 THE GLENORCHY WASTE COMPOSITIONAL ANALYSIS

The Waste Compositional Analysis was carried out concurrently with the questionnaire survey. It was intended to help the author confirm or refute certain assumptions about which recyclables would be most advantageous to collect. Samples were taken from the three test neighbourhoods. The samples represented waste from about 6% of the households. These data were used as background information using a qualitative approach to the analysis of household waste.

5.1 NEED FOR TASMANIAN DATA

Prior to this Study, no studies on waste composition in Tasmania had been published. The local governments have had to rely on the data from the mainland and overseas for their understanding and appreciation of amounts, types and changes in the solid waste stream (Cunningham, 1979; Skitt, 1972; State Pollution Control Commission, 1984).

Tasmania has regional differences from the mainland states, such as a dispersed population, the absence of many of the transnational corporations and fast-food chains, lower income levels, different marketing strategies by packaging companies, a more relaxed lifestyle, a cooler climate, smaller cities, and limited economies of scale for recycling opportunities.

This unique Tasmanian context has affected attitudes and practices regarding waste management. Tasmania's isolation has resulted in lower land values and hence lower cost for tip sites. There has been less urgency to become involved in recycling because it has not been cost-effective. However, it is becoming more apparent that the 'land luxury' situation which councils have come to take for granted is changing. For example, Brighton Council, on the metropolitan fringe of Hobart, was persuaded that it was prudent to negotiate with Glenorchy Council to have access to the new Glenorchy Tip. The chief reason for this apparent cooperation was that Brighton Council could not find a suitable and acceptable tip site in their own municipality (Murdoch, 1983).

Several other councils on the Hobart fringe are in similar circumstances. The growing difficulty and cost of selecting, constructing and maintaining tip sites are mounting (Metropolitan Waste Disposal Authority, 1981).

The Analysis should be useful to local councils in gaining a better understanding of the composition of the waste stream. The data from Glenorchy's sampled neighbourhoods should be interpreted as a one-off event. There were three sets of samples, one set coming from each test neighbourhood. The data were not

seen as absolutely essential to the start of the Glenorchy Recycling Project. However, the data were seen as an indicator of what people were doing with their waste.

Second, this being the first waste compositional study done in Tasmania, a certain amount of trial and error (heuristic) approach was employed. This method of testing is appropriate for new areas of research.

5.2 PROBLEMS OF WASTE COMPOSITIONAL STUDIES

Much of the literature on waste composition has been written by engineers concerned with the efficiency of collection, storage and disposal of waste (Marks & Liebma, 1971; Northeast Maryland Waste Disposal Authority, 1981; Rosenthal, 1979). The information gained by compositional analyses has been directed towards improvement of collection vehicles, reception hoppers, equipment for waste reduction, processing and magnetic extraction equipment and storage containers' capacity and strength (Albrecht, 1980; Levy & Rigo, 1976; Beltrami & Bodin 1973; Bodner et al, 1970; Savas & Stevens, 1978; Schneider, 1958; Screvane, 1959). The Glenorchy Study did not deal with engineering concerns, but dealt mainly with the need to get a source separation project going (Anon - 6, 1979).

The significant increase in the construction of resource recovery plants in the USA and Europe over the past two decades has resulted in community planning engineers conducting waste compositional studies (Anne Arundel County, Maryland, 1979; Hershaft, 1970). These compositional studies were intended to help forecast the amount of waste which could be expected to be processed at centralized plants (Flintoff & Millard, 1969; Shabecoff, 1986). Unfortunately, the studies have often proven to be of limited use when used as a forecasting tool. Harvey Alter in his book, Materials Recovery from Municipal Waste, challenges the utility of many of these studies. He states:

"...that to overcome shortcomings of published compositions, and to relate compositions to the planning and operation of specific facilities, planners often insist on determining the composition of the waste for their community. These kinds of studies have the grave danger of being nearly useless. Such compositional studies pertain only to the particular day and are not easily extrapolated to other days" (Alter, 1983).

Alter suggests these studies have usefulness only as baseline data. He warns against the tendency by some people to focus on the minutiae of waste composition. For example, dividing paper into each type is an unnecessary exercise. Rather, he suggests that it is better to concentrate on what is potentially recoverable and focus on those categories. His general message is

not to fret over the details or precision of compositional determination. The variations from the normal seasonal causes will be greater than the variations between the minutiae of the categories (Alter, 1983).

The sample size is also important. Frank Berkheisel of the National Centre for Resource Recovery, Washington, D.C., suggests:

"No individual sample has high reliability in itself, but a multiplicity of samples can give you pretty high confidence. We have tended to take the approach that many small samples are superior to one large gigantic effort" (Berkheisel, 1978).

Berkheisel maintains that repeated samples can give one "pretty high confidence." Klee suggested that the sample size should be at least 90 kg to reduce the variances. When samples are over 140 kg, the sample variance increases much more slowly. The optimum weight for sampling purposes of each sample is in the range between 90 kg and 140 kg (Klee, 1980). The Glenorchy samples were slightly less than 90 kg due to the practical reasons of time, cost and utility of data.

Another important consideration in actually carrying out a study is the sheer difficulty of sorting the domestic waste into components for weighing (Higginson, 1971). It is time consuming, labour intensive, dirty, dangerous and oftentimes of only marginal utility. This is why few studies are carried out and why there is much recycling of the old data (National Commission On Productivity, 1973; Sobal et al, 1981).

Few cities or agencies have attempted the difficult task of weighing waste by component. Klee cites three reasons:-

Complexity: Waste compositional studies usually involves more than one component. It may be necessary to measure from four to eleven components of the waste stream.

Cost: Weighing a collection vehicle is a relatively low-cost procedure. Selecting a sample of waste and separating it into a number of components prior to weighing is much more expensive and time consuming. The amount and size of samples one would like to measure are often not practicable because of cost and time (Ignall et al, 1972; City of Scottsdale, Arizona, 1975; City of Wollongong, 1975; O'Connor, 1979).

Lack of Comparable Data: Because of the time and expense required to sample waste components, there are fewer data available regarding this aspect of waste characterization than for the estimation of waste quantity. Hence, fewer guidelines are available (Klee, 1980).

The changing attitudes and practices of residents towards waste disposal poses a problem for planners (Hershey, 1983). In the early 1970s, the high-technology solutions were hailed as the way to go. Hence, large plants sprung up over the fuel-poor European landscape and the USA terrain. Many plants were over-designed and too complex. The Baltimore's Pyrolysis Plant is a good example (Harrison & Vesiland, 1980). As a result of these centralized plants' failures, source separation recycling received a boost. Local community groups began setting up recycling schemes with great enthusiasm and little money. This counter trend away from centralized plants has continued to the present. Hence, compositional data at the regional level, arrived at a decade prior to the central plant's construction, have often proven to be inaccurate for predicting the rate of domestic waste 10 years later because of these changing attitudes and practices of waste management and recycling schemes. In Tasmania, since there were no data to compare changes, setting up a recycling project did not impact any plans for centralized waste treatment.

5.3 AIMS, METHODOLOGY AND SUMMARY OF THE COMPOSITIONAL STUDY

The following aims of the Waste Compositional Analysis were: to gain a better understanding of the type and amount of waste being discarded in the three test neighbourhoods of Glenorchy; to establish relative differences in waste composition among sampled neighbourhoods; to compare the results obtained in this Study with mainland and overseas data; to document the trends in consumption and disposal habits using Glenorchy, Tasmania, as a case study; to make use of the data for further research and for testing the likelihood of success for a source separation recycling scheme.

The methodology employed by the author in carrying out the Glenorchy Waste Compositional Analysis was to measure selected households' regular garbage in the three test neighbourhoods prior to the start-up of the recycling project. About 5% of the bags or cans of raw garbage were collected in each neighbourhood. These were hand separated into the 7 categories and weighed and calculated for the volume of the garbage.

The collections were made without the knowledge of the householders so as to not bias the findings of the contents. The strength of this methodology was that with a relatively small sample of each neighbourhood one could derive a reliable data base for the waste contents for the whole of Glenorchy.

The weakness was that ideally there should have been samples collected after the recycling Project had started in order to compare the amount and type of garbage from the waste stream before and after the Project started. This would have provided a good comparison of the effectiveness of the recycling

Project.

A waste compositional analysis' role in planning a recycling operation can be useful. It can confirm the relative amounts of recyclables which are presently being discarded in the normal garbage. At the same time, it can help the recycling planner to learn of certain habits and nuances peculiar to that neighbourhood, which might affect participation in a recycling programme.

5.4 AUSTRALIAN COMPOSITIONAL STUDIES

Waste compositional analysis in Australia is a relatively recent activity. The Australian studies began in 1968 in Sydney. Over the past decade and a half, most capital cities have carried out at least one waste compositional study. The main studies have been carried out in Sydney (1968), Perth (1971-2), Melbourne (1974), (1978), and more recently in Brisbane (1977). The studies looked at waste generation by component with a view towards estimating the present and future capacity of tip sites and/or the requirements for any alternative disposal systems. These four major studies have provided the background data used in estimating the composition of domestic waste in Australia over the past two decades.

Kirov and Van den Broek carried out a study of Sydney's waste in 1968. Their paper, The Characterisation of Municipal Solid Wastes, delivered at the Australian Waste Disposal Conference at the University of New South Wales in 1971, made some key observations. By weight, refuse was increasing on a per capita basis; waste was becoming bulkier; the physical and chemical composition of waste was extremely variable; and significant differences existed between the refuse generated in different cities (Van Den Brock & Kirov, 1972).

The Perth study carried out in 1971-2 revealed that there was more use of steel cans in Perth (12% of the waste stream by weight), than in either Sydney or Melbourne. The 1971-72 Perth study served as a background study for the 1980 Broken Hill Proprietary Ltd. (B.H.P) study. B.H.P.'s 1980 study showed that the ferrous metal component of the domestic waste stream had dropped from 12% in 1971-72 to 8.2% in 1980 (Sefton, 1979).

This drop of 4% in weight of steel cans can be attributed to the increased use of the aluminium drink can which didn't appear on the earlier studies except under the 'other metals' category.

In Melbourne, a study was conducted in 1974 by the Victorian Environment Protection Authority. Food and garden wastes were the largest category by weight, 46%. This was 11% higher than Sydney's and Perth's food and garden wastes. A simple explanation is elusive.

TABLE 5-1

ESTIMATED COMPOSITION OF DOMESTIC WASTE IN 3 AUSTRALIAN CAPITAL CITIES USING A POPULATION WEIGHTED MEAN. (These three cities comprise 49% of the Australian population).

	SYDNEY 1968 POP.2.8m		MELBOURNE 1974 POP.2.7m		PERTH 1971-2 POP.0.7m		POPULATION WEIGHTED MEAN
	%	kg/pa	%	kg/pa	%	kg/pa	kg/pa
Food & garden wastes	35	101	46	73	35	69	86
Paper products	35	101	25	39	28	55	69
Steel	5.5	16	7.5	12	12	24	15
Other metals	0.5	2	0.5	1	0	0	1.5
Glass	16	46	15	24	15	29	35
Rags	2	6	1.5	3	2	4	4.5
Plastics	2	6	3	5	3	6	5.5
Other	1	3	0	0	2	4	2
TOTAL	290		160		197		224

* pa is person annum

SOURCES;

(i) E. van den Broek & N.Y. Kirov, 'The Characterisation of Municipal Solid Wastes', 1971, Aust. Waste Disposal Conference, Sydney, N.S.W.

(ii) Annual Report, 1974-5, Victoria Environment Protection Authority.

(iii) W.A. Public Health Dept, 1974, A Report on Community Waste in Perth Metropolitan Region.

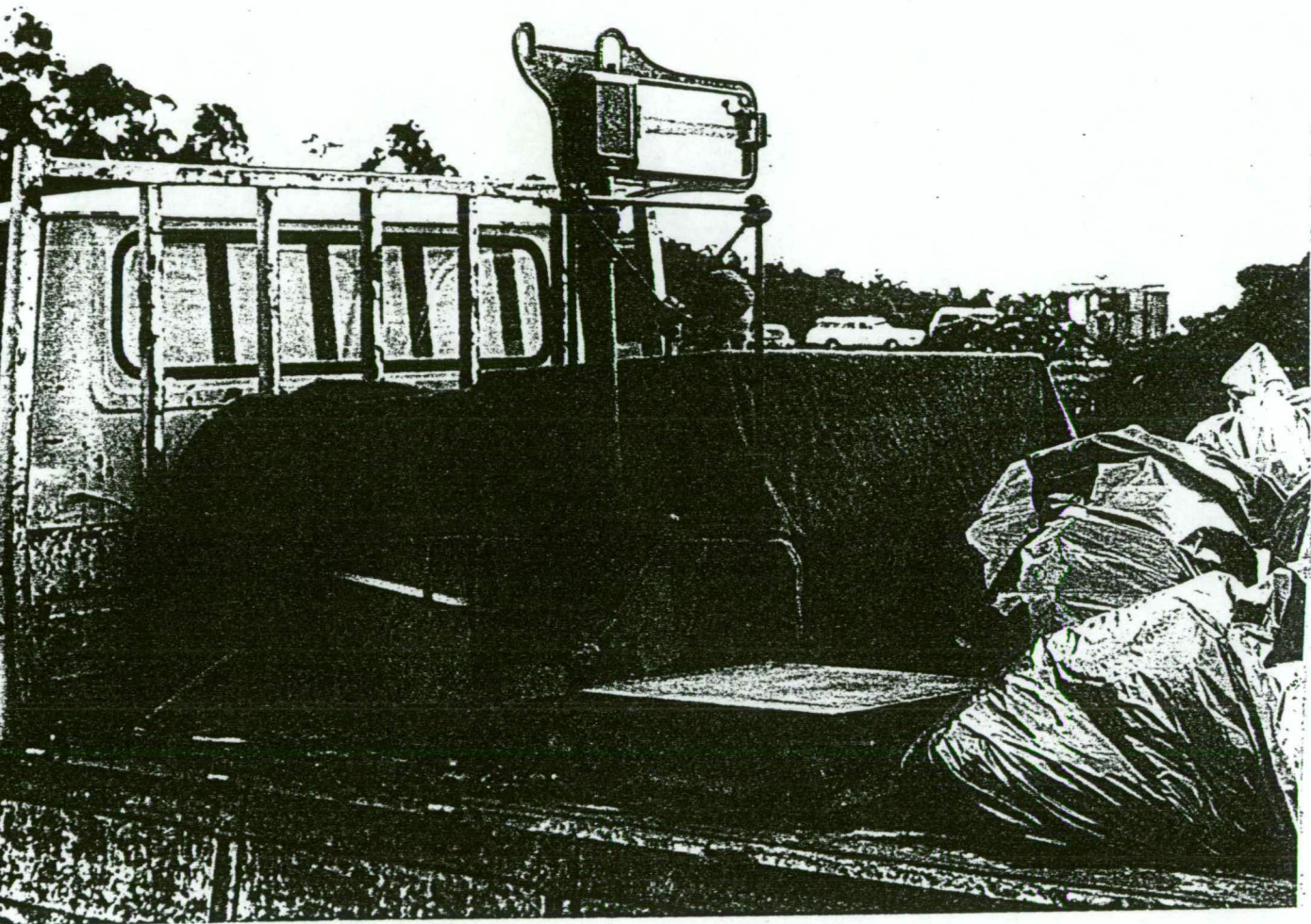
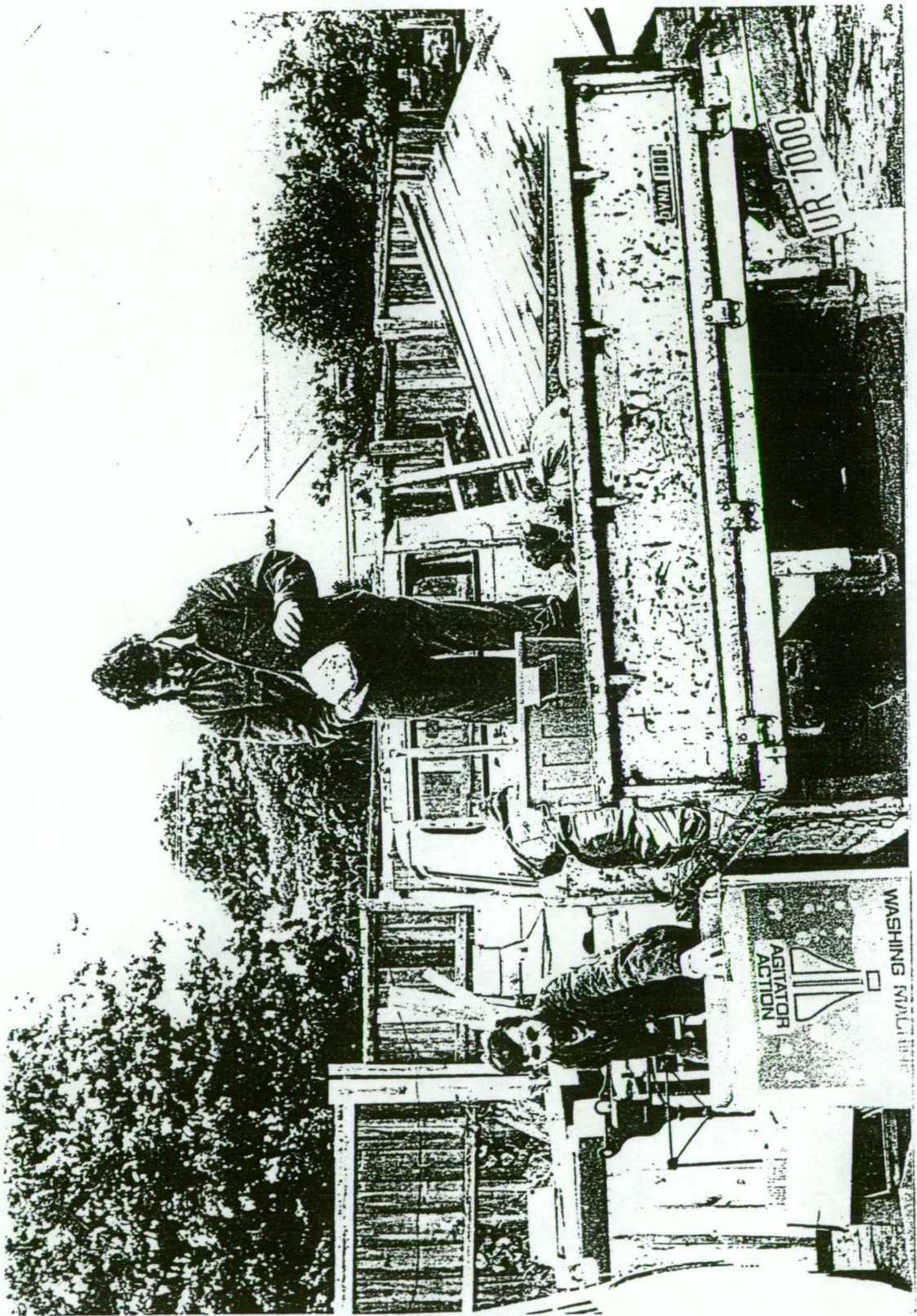


Plate 5-1
At the Glenorchy Tip Site 1981

Plate 5-2



Bill Dean and Andy Peploe sorting samples of waste.

TABLE 5-1 gives the estimated composition of domestic waste in the three capital cities as described above. The food and garden wastes were 46% in Melbourne in 1974 compared to 35% in Sydney, 1968, and Perth, 1971-72. This 11% difference may be due to several possible causes, such as the sampling techniques, seasonality, drier samples and different life-styles.

Paper products were higher in Sydney, 35%, than Melbourne's 25% or Perth's 28%. In Perth, steel was 12% compared with Sydney's 5.5% and Melbourne's 7.5%. The other categories were roughly similar in each city.

Overall, Sydney's waste was highest with 290 kilograms per person per annum; Perth generated 197 kilograms per person per annum and Melbourne's waste was only 160 kilograms per person per annum. From these data, it might suggest the milder the climate, the more waste is generated. Cool Melbourne generated considerably less than Sydney and Perth. A second possible explanation could be that the 1974 figures for Melbourne were modified by the increased public awareness aimed at conserving energy. (Middle East Oil Embargo). A third explanation is that Sydneysiders are simply more extravagant in their use of materials than Melbournites.

In 1977, Maunsell Consulting Engineers did the Brisbane Waste Composition Study. They used 10 categories, with three categories - wood, ashes and 'other,' making up less than 1% of the total. Food wastes made up 37%; paper products 24%; glass/ceramics 17%; metal products 10%; plastics 8% and 'other' 4%. The emphasis in the Brisbane study was to determine the feasibility of designing a composting plant. Emphasis was placed on the 'compostible' percentage of the waste stream which came to 61% (Maunsell, 1978). In a near-tropical city like Brisbane, there was actually less food and garden wastes percentage-wise than in Sydney, Melbourne or Perth. This possibly could be explained by the lower consumption of fresh foods, (unlikely), the more careful use of food wastes for on-site composting, the seasonality of the samples, or errors in sampling.

The composition of domestic waste by weight in Victoria based on evidence given by Victorian Environment Protection Authority in 1983 reported food wastes at 41.9%. The breakdown of garden wastes of 5.5% raised this total to 47.4% which is relatively close to the 1974 Victorian data of 46% for food and garden wastes. The big change has been in the packaging waste listed at 35%. This breakdown doesn't list glass, steel, plastics separately, so one cannot judge the separate component breakdowns.

In the Maunsell study in Brisbane, 8% by weight for plastics was recorded. This 6% jump from Sydney's 1968 figure of 2% helped confirm the overall increase of plastic packaging in the last 10 to 15 years nationally. The Australian Environment Council stated



Plate 5-3

Counting Waste at Macquarie St. - Colony 47

that: "...packaging is a major factor in the generation of municipal waste" (Australian Environment Council, 1979). A major part of the packaging was plastics.

In the Friends of the Earth's submission to the Parliamentary Committee of Enquiry into deposit legislation made in March, 1983, data were available for the plastics component of the domestic waste. In Victoria, plastics made up 4.6% by weight of the total domestic garbage. Of all the packaging contents, plastics accounted for 9.9% by weight. The PET soft drink containers of 2 litres, 1.25 litre and 300 ml single serve have since come on the market. These beverage containers likely will increase the plastic content of domestic waste (Friends of the Earth, 1983).

Plastic milk containers of 2 and 4 litre variety also have been marketed recently. There appears a definite trend towards plastic beverage containers in the 1980s. TABLE 5-2 shows the two studies done in Melbourne in 1974/5 and a follow-up study in 1977/8. Paper products had the largest drop from 24.9% to 20.8%. Plastics increased from 3.0 to 4.6% over the four year period. Otherwise the percentages stayed about the same.

Cairns led the cities in glass waste with 23% by weight (Hoare & Kirov, 1974). The percentage of food/garden waste was 36%, just 1% more than Sydney's figure, but over 9% less than Adelaide's count.

Perth had the highest percentage of steel/aluminium/other metals with 14.7%. This could mean that the Perth citizenry was thirstier than the rest of the Country and/or they drank more of their beverages in metal containers.

The data must be read cautiously because of the different dates of the studies and different categories. The studies do present data for comparing trends over the past decade or so.

TABLE 5-2

PERCENTAGES (BY WEIGHT) OF EACH WASTE CATEGORY IN DOMESTIC GARBAGE FROM FIVE AUSTRALIAN CITIES

Waste Category	MELBOURNE		SYDNEY	ADELAIDE	PERTH	CAIRNS
	1974/75	77/78				
PAPER PRODUCTS	24.9	20.8	35	19.4	22.0	28.0
FOOD WASTES	41.2	42.3	35	45.2	43.2	36.0
GARDEN WASTES	4.9	5.3		--		
STEEL	7.5	7.7				
ALUMINIUM	0.5	0.6	6	9.9	14.7	8.0
OTHER METALS	0.2	0.0				
GLASS	14.7	15.5	16	19.8	12.1	23.0
RAGS	1.4	1.3	5	--	1.3	
TIMBER	0.1	0.1		--	--	5.0
PLASTICS	3.0	4.6	3	3.5	2.3	
INERT WASTES	1.6	1.8		2.8	4.4	

Source: Conolly R. (1979), "Present and Future Trends in Sydney's Waste Management", Search, Vol. 10 No. 4, April, 1979.

5.5 OVERSEAS DATA

The composition of solid waste has changed in the United Kingdom, Europe and North America from predominantly ashes produced from coal burning furnaces and food wastes in the 1950s, to paper and packaging (plastics making up a large percentage of the packaging by volume - not weight) and discarded appliances in the 1980s (Dept. of The Environment, 1971; Alter, 1983).

In the United Kingdom, it was estimated that the proportion of dust and cinders which used to comprise over 50% of the domestic refuse in 1960 has decreased to about 30% in 1970 due to the advent of smokeless fuels and central heating. However, paper and cardboard over the same period have increased to 33%, up from 16% in 1960. Food wastes have remained fairly constant, as have cloths and rags (Denny, 1971; Skitt, 1972).

In the USA, the average weekly total disposed of by weight in 1980 was 14.5 kg per household of which paper/rags made up 46%. Alter stresses that the actual per household rate in the USA has decreased from 1935 of 17.0 kg to 1980 of 14.5 kg. This decrease is related directly to the decrease in the use of coal for home heating. With the advent of oil and gas for home heating, the residual waste (ashes) has dropped considerably over the past 50 years (Alter, 1983).

In Australia, domestic coal burning furnaces generally were not needed because of the mild climate. Hence, since the 1950s, the Australian changes in waste composition have been slower and less dramatic than in the United Kingdom, Europe and North America (Knight, 1985; South Australian Department of Public Health, 1975).

The big increase has occurred in Australia in the packaging waste category - 35% by weight as of 1981 (Bates, 1987). This included bottles, cans, plastics and paper especially used for packaging.

5.6 METHODOLOGY FOR THE WASTE COMPOSITIONAL STUDY

The household garbage from the three test neighbourhoods described above was sampled in October and November, 1981. The Glenorchy Council granted permission to undertake the collection and the sorting of the waste at the Glenorchy Tip. The site for sorting and weighing of the waste was shifted to the Colony 47 site on Macquarie Street, Hobart, after the initial experience of sorting Neighbourhood C's waste at the Glenorchy Tip. Because of the inclement weather, sorting was extremely difficult to continue at the Glenorchy Tip site.

Residents were not aware that their garbage was being sampled. The recorded data were related to the whole neighbourhood and not to individual households to ensure anonymity of each household.

Domestic garbage was sorted into seven categories. (See tables below). The categories of aluminium, food, glass, paper, plastics, rags/miscellaneous and steel cans were chosen because: the practical need to aggregate data from relatively small samples; these were the main areas of interest in the study for potential recycling; a limited budget precluded further breakdowns; and other studies tended to include these seven categories most frequently.

5.6.1 Neighbourhood A

Bill Dean, a local Hobart conservationist whose truck was used for the collection of the garbage, and the author made the collection run on Tuesday evening, 11.00 p.m., October 13, 1981. The intention was to pick up samples at every 10th house but it soon became apparent that it was not going to be possible to do so because many residents had not set out their garbage for collection. It was decided to attempt a modified random sample by selecting at least one garbage container from each street and two containers from the longer streets in the Neighbourhood. Below is the number of houses on each street collected from out of 270 householders of Neighbourhood A:

Islington Road	2 houses
Katoomba Crescent	2 houses
Walker Street	2 houses
Barclay Crescent	1 house
Riverview Parade	1 house
Lorraine Crescent	1 house
Marys Hope Road	2 houses
TOTAL	<u>11 households</u>

These households represented 4% of the total households in Neighbourhood A. However, they represent a much higher percentage of those households which had set their garbage out for collection.

5.6.2 Neighbourhood B

Neighbourhood B's samples were collected on the evening of November 10, 1981 between the hours of 10.30 and 11.30 p.m. Bill Dean and the author made the rounds at the designated houses. As in Neighbourhood A, many houses had not placed their garbage containers out for collection even though the All-Round Waste Disposal Cleaners Pty. Ltd., stated that 12.00 a.m. - midnight was the normal starting time of collection for this section of Glenorchy. The samples represented garbage from about two-thirds of the total Neighbourhood B. The sample represents 206 households out of 313 possible households.

Booth Avenue	1 house
Grove Road	1 house
Roseville Place	1 house
Herbert Street	2 houses
Nambour Place	2 houses
Shenstone Place	1 house
Duncan Street	1 house
Riverway Road	1 house
TOTAL	<u>10 households</u>

These 10 households represented 4.8% of the total households in the Neighbourhood B. However, they represent a much larger percentage of households which had set their garbage out for collection.

Neighbourhood B's samples were sorted at 307 Macquarie Street, Hobart.

5.6.3 Neighbourhood C

Neighbourhood C's garbage was the first neighbourhood to be collected and sampled. Bill Dean and the author began the collection on October 2, 1981, at 7.30 a.m. The collection was completed by 8.45 a.m. All-Round Waste Disposal Cleaners Pty. Ltd., the private garbage collectors, indicated they generally service the Claremont area after 9.00 a.m. on collection day. This day they were either more efficient or there was less garbage in other precincts set out for collection because the crew and truck were only 15 minutes behind our truck.

Out of 254 dwelling units in Neighbourhood C, 26 households' garbage was sampled or 5.5% of the total number of

households. Below is the number of houses on each street from which garbage was collected:

Box Hill Road	2 houses
Belgrave Street	3 houses
Rosebar Street	2 houses
Westfield Street	2 houses
Wyndham Road	2 houses
Abbotsfield Road	4 houses
Euston Street	1 house
Cleburne Street	2 houses
Colson Street	1 house
Leighland Road	1 houses
Hilton Road	2 houses
Delange Place	2 houses
Eltham Place	1 house
Main Road	1 house
TOTAL	<u>26 households</u>

5.7 RESULTS

5.7.1 Overall Totals and Comparisons

The samples from the three neighbourhoods were weighed and then calculated based on the total number of households divided by number of persons per household to arrive at a figure of waste per household per capita per week.

TABLE 5-3 shows that the estimated amount of waste which Glenorchy residents discard was 2.1 kilograms per capita per week. If one uses the average number of persons per household as 3.3, the weekly average of waste per household was 6.9 kilograms. This was less than the national average of 8.8 kilograms per household per week as calculated by Pausacker and Andrews (Pausacker & Andrews, 1983). This difference of 1.9 kilograms of total waste discarded was significant. It meant that Glenorchy was discarding by weight, 94,091 kilograms per week.

This lower than national average in Glenorchy suggested that the Glenorchy residents were doing some of the following: consuming less disposal products; discarding less waste overall; and/or recycling more items.

TABLE 5-3 ESTIMATED WASTE PER HOUSEHOLD/CAPITA/WEEK
IN GLENORCHY, TASMANIA, 1981

NEIGHBOURHOOD	PERSONS/ HOUSEHOLD	KG OF GARBAGE/WK	KG/HOUSE -HOLD	KG/CAP/WEEK
A	3.5	1916.8	7.06	2.0
B	2.9	1247.3	6.10	2.1
C	3.2	1899.4	7.03	2.2

In all neighbourhoods sampled, residents used the heavy duty green plastic bags most frequently as the waste container. The green plastic bags were not calculated as part of the waste. This was because of the uncertain regular usage of green plastic bag. The estimated portion of householders who did not set out a container was 25%. Because these collections were all trash and the residents did not know that their trash was being picked up, there was no need to ask why they didn't participate.

A high proportion of households did not place any container of household garbage out for collection. This could have meant that they took it to the tip themselves; they forget to set it out; they didn't have sufficient waste to set out; (1 or 2 persons in a household); and/or they already recycled their garbage.

TABLE 5-4 HOUSEHOLD GARBAGE ANALYSIS - NEIGHBOURHOOD A
1981, GLENORCHY, TASMANIA

CATEGORY	ACTUAL SAMPLE IN KG	ESTIMATED KG FOR NA	PERCENTAGE BY WEIGHT	VOLUME CUBIC METRES	PERCENT BY VOL.
-----	-----	-----	-----	-----	-----
ALUMINIUM (4 cans)		---	---	---	---
FOOD	39.4	986.6	51.4	.99	14.8
GLASS	13.0	323.2	16.9	.28	4.2
PAPER	15.9	396.9	20.7	3.05	45.8
PLASTIC	4.4	109.6	5.7	1.72	25.9
RAGS/MISC.	---	---	---	---	---
STEEL CANS	5.1	127.6	6.7	.67	9.2
Total	77.8	1916.8	100.0	6.65	99.9

Table 5-4 shows that food wastes contributed by weight 51.4% of the domestic waste. Paper was the second highest waste component with 20.7%. Glass accounted for 16.9% by weight. The steel can category was significant in that when compared to aluminium cans, steel drink and food cans significantly exceeded the aluminium cans in southern Tasmania. Plastics were close to the expected norm of 6 to 8%.

TABLE 5-5 HOUSEHOLD GARBAGE ANALYSIS - NEIGHBOURHOOD B
1981, GLENORCHY, TASMANIA

CATEGORY	(WEIGHT) ACTUAL SAMPLE IN KG	ESTIMATED KG.FOR N'HOOD B	PERCENTAGE BY WEIGHT	(VOLUME) CUBIC METRES OF SAMPLES	% BY VOL.
ALUMINIUM	---	---	---	---	---
FOOD	28.5	569.2	46	1.1	10.7
GLASS	9.1	181.4	15	1.9	18.4
PAPER	13.4	267.6	21	3.6	35.0
PLASTIC	3.7	74.8	6	2.7	26.2
RAGS/MISC.	---	---	---	---	---
STEEL CANS	7.7	154.2	12	0.9	8.7
TOTAL	62.4	1247.3	100	10.3	99.0

In Neighbourhood B, Table 5-5 shows that food wastes was the highest component by weight with 46%. Paper waste had 21% by weight, while glass was 15% by weight. The steel can category was higher by almost 5% than in Neighbourhood A. This could suggest that more residents in Neighbourhood B eat and drink out of tin cans than in the higher income area of Neighbourhood A. (Neighbourhood B had an older population). Again, aluminium was conspicuous by its absence.

TABLE 5-6 HOUSEHOLD GARBAGE ANALYSIS - NEIGHBOURHOOD C
1981, GLENORCHY, TASMANIA

CATEGORY	(WEIGHT) ACTUAL SAMPLE IN KG	ESTIMATED KG. FOR N'HOOD C	PERCENTAGE BY WEIGHT	(VOLUME) CUBIC METRES OF SAMPLES	PERCENTAGE BY VOLUME
ALUMINIUM (4 CANS)		(80 CANS) 1.36 KG	---	---	---
FOOD	54.4	1088.6	57.3	2.4	15.5
GLASS	17.1	342.4	18.0	3.5	22.5
PAPER	4.0	80.8	4.2	4.3	27.7
PLASTIC	7.9	158.8	8.3	3.4	21.9
RAGS/MISC	.5	10.0	.6	---	---
STEEL	11.0	219.8	11.6	1.9	12.3
TOTAL	94.9	1899.4	100.0	15.5	99.9

Table 5-6 shows the data for Neighbourhood C. Food waste again predominated by weight with 47.3%. Paper was down, with only 4%, while plastic packaging was up to 8.3% by weight. Glass was about the norm with 18%. Steel cans again showed a strong trend to dominating the food and drink category with 11%.

TABLE 5-7 HOUSEHOLD GARBAGE ANALYSIS - TOTALS FOR
NEIGHBOURHOODS A,B,C 1981, GLENORCHY, TASMANIA.

<u>CATEGORY</u>	<u>TOTAL WEIGHT IN KG FOR A,B,C</u>	<u>% BY WEIGHT</u>
ALUMINIUM	----	----
FOOD (ORGANICS)	122.3	52.0
GLASS	39.2	16.7
PAPER	33.3	14.2
PLASTICS	16.0	6.8
RAGS/MISC.	0.5	0.2
<u>STEEL CANS</u>	<u>23.8</u>	<u>10.1</u>
TOTALS	235.1	100.0

Table 5-7 combines the 3 neighbourhoods' data and then breaks the data out into % by weight.

Overall, food wastes (organics) comprised the largest percentage with 52% by weight of the waste components. Glass was second with 16.7%. Paper was third with 14.2%, while steel cans comprised 10.1% by weight. Plastic wastes overall only made up 6.8%. Rags and miscellaneous were very low with 2%.

These figures are close to the Melbourne figures of 1977-78 study. (See Table 5-2) Food wastes in Melbourne combined with garden wastes were 47.6%, while Glenorchy's was 52%. Glass wastes in Melbourne were 15.5%, compared to Glenorchy's 16.7%. Paper waste was 20.8% in Melbourne, (bigger newspapers), while in Glenorchy it was 14.2% by weight. This was one contributing factor to the 6% by weight of Melbourne's paper waste compared to Glenorchy's paper waste weight.

Plastic wastes in Glenorchy were 2.2% greater than the 1977 Melbourne rate of plastics. This reflected the increase in Glenorchy's plastic packaging over the 5 years from the Melbourne figures.

The steel cans were 7.7% in Melbourne, while Glenorchy had a 10.1% for steel cans. This reflected the larger percentage of steel cans in the Southern Tasmanian market.

5.7.2 Aluminium

In the Glenorchy sample, Tables 5-4, 5-5, 5-6, & 5-7, show aluminium was conspicuous by its near absence. The low figure of less than 1% by weight reflected the limited usage of aluminium drink cans in southern Tasmania. It is only recently that an influx of aluminium cans from the mainland has begun to appear in supermarkets. The steel can tended to dominated the market in the Hobart area in 1980s. The prospects are good for aluminium recycling, as Tasmania has its own smelter at Bell Bay at the northern part of the State. The problem remains as to how sufficient quantities of aluminium cans can be collected, crushed, compacted and shipped to Bell Bay economically to encourage a systematic approach to recycling (Begg, 1981; Beard, 1984; Anon-2, 1981).

5.7.3 Glass

Australia-wide, total glass waste by weight was 15.5%, while the Glenorchy data revealed 16.6%.

Tables 5-4, 5-5, 5-6, & 5-7, show the glass data from all the neighbourhoods. The data were broken down as follows: Neighbourhood A had 16.9%; Neighbourhood B had 15% and the highest rate was in Neighbourhood C with 18%. The lowest generation rate was in Neighbourhood B which had the highest percentage of older residents. Neighbourhood A and C had a higher percentage of families with children and thus more consumers of beverages and foodstuffs contained in glass packaging. Glass wastes were the second most prevalent material by weight. The estimated weekly amount of glass generated prior to the start of the collection phase in the three neighbourhoods was:

Neighbourhood

A = 323.2 kilograms	kilograms per household = 1.18
B = 181.4	= .60
C = 342.4	= 1.35
847.0 kg/week	total kg/week = 1.04

For all the Municipality of Glenorchy, there would have been theoretically 16,940 kilograms per week of glass being discarded in the waste stream.

Refillable Bottles

The 1977 Maunsell Study of Brisbane's waste (Maunsell & Partners, 1978) recorded only 7 refillable bottles out of 2005 households or 1 for 286 houses. (Refillables for this purpose included deposit and returnable bottles). This was a rate of .0035 refillables per dust bin per week. It was estimated in Glenorchy that 7 refillables per 245 houses or 1 refillable bottle per 35 households per week were discarded based on the

compositional analysis. Very few 'refillable bottles' were discarded in normal household garbage. This could have meant several things: people were more careful about the refillable bottles and tended to take them to a collection depot; they did not buy as many refillable bottles for home use; and/or they saved the bottles for another collection or private purpose. Frank X. O'Connor, former manager of All-Round Waste Disposal Cleaner Collecting Services, the former private contractor for garbage removal in the Glenorchy Municipality, stated to the author that from his unofficial observations of the 18,000 +/- dwellings in Glenorchy, only about 60 refundable deposit bottles were set out each week separately for the garbage collectors to redeem for pocket money. This represents only one deposit bottle per three hundred householders.

The data would suggest that there was limited scope for increasing the reusable rate for refillable bottles in Glenorchy.

5.7.4 Paper

Paper waste is a major component of the waste stream, 26% to 35% by weight in Australia (Southgate, 1979). In 1982, the paper waste component of domestic waste generation in Australia was 20.8% by weight. In Brisbane, paper made up 24.5% in 1977 (Maunsell, 1978). In the United Kingdom in 1968, paper waste constituted 37% by weight. In the USA in 1971, it was 28% by weight (Anon - 6, 1979).

Table 5-7 shows the Glenorchy figure of 14.2% for paper waste reflected the thinner newspapers in Tasmania. Tables 5-4, 5-5, and 5-6 revealed that the paper waste component had the greatest variation among the three neighbourhoods. Neighbourhood A and Neighbourhood B each generated about 5 times as much paper waste as Neighbourhood C. Several possible explanations could account for this wide variation. Neighbourhood C reused/recycled more of its waste than the other 2 neighbourhoods; burned more paper on-site; and/or residents bought fewer newspapers and magazines than Neighbourhoods A or B.

Paper waste was mainly newsprint, magazines and packaging. Neighbourhood C's low percentage confirms that the higher the income group, the more paper waste will be generated.

In the USA, Chris Canotis, of Wheelabrator-Frye/De Matteo Construction Company who built the Resco plant in Sargus, Massachusetts, observed that waste compositional data could change significantly as the control over waste paper and the construction of new and improved incineration/steam producing plants increases because of high energy costs. In parts of USA, even using conservative estimates, the potential value of newsprint as an energy source is greater than its historic value as a recyclable (Ball & Ho, 1984). This means that more paper waste will be burned for energy in the USA in the years ahead and less used for repulping or cellulose insulation. However, in

Australia, where there is only one incinerator (Sydney), paper should maintain its utility as a recyclable rather than as a burnable item. Loumbos, "The Waste Paper People," on their brochure has estimated that export sales of waste paper from their Sydney base have increased from .50 metric tonnes per month in 1979 to 1500 metric tonnes in 1983 (Loumbos, 1982). The potential for recycling paper was estimated at 80% for Australia (Boyd, 1982). With new products being made from waste paper, the demand may increase as the product diversification by the manufacturers moves beyond the traditional egg cartons, toilet paper and packing sheets. For Glenorchy, the collection of paper waste offered a good potential if markets can be maintained.

In Glenorchy, there was scope for substantial increase in paper waste collection in Neighbourhoods A and B. The weekly collection data suggest that there was an increase in paper waste collection since the start of the Project. In Tasmania, Tony Kregor, former manager of TasWastes, reported that the company invested in a paper shredder, baler and binder machine worth \$250 000 in an effort to try and export paper waste to southeast Asia. This operation had potential for the small collectors of paper waste like the Society of St. Vincent de Paul. However, due to marketing and collection costs, this operation has since been shut down as of late 1985 (Kregor, 1985).

Paper waste accounted for 14.2% by weight in Glenorchy. For the three sampled neighbourhoods, the average weekly amounts were:

Neighbourhood

A =	396.9 kilograms	per household =	1.44 kilograms
B =	267.6	=	.89
C =	80.8	=	.32
Total	745.3 kg/week	Total	= .88 kg/week

Using a 20:1 ratio based on 18,000 households in the whole municipality, and 900+ households in the three sampled neighbourhoods, there would have been theoretically 14,906 kilograms of paper in the Glenorchy waste stream per week.

5.7.5 Food/Organic Wastes

Food/organic wastes Australia-wide were 47.6% by weight. Glenorchy figures revealed that food wastes comprised 51.3% by weight. The large percentage of food wastes nationally and locally suggested the need for establishing an educational programme to encourage and demonstrate the techniques and virtues of composting of food wastes on each householder's own site.

Tables 5-4, 5-5, and 5-6 show that Neighbourhood C's food waste was 57.3% by weight, followed by Neighbourhood A with 51.4% and Neighbourhood B with 46%. Neighbourhood C had more children and generally larger families than Neighbourhood A or

Neighbourhood B. The family size and age of the residents in the various neighbourhoods suggested a correlation between the relative amounts of food wastes being discarded and the size of the family. Neighbourhood B had the largest number of older residents and the lowest amount of food wastes.

5.7.7 Plastics

Plastics come in many sizes and shapes. Today, much of society's packaging is plastic (Cavanaugh, 1985; Packaging Council Of Australia - 3, 1980). However, in terms of weight, plastics represented only 4.6% of the domestic waste stream nationally.

The Glenorchy figures were higher than the national average with 7.3% overall. Tables 5-4, 5-5, & 5-6 show that Neighbourhood B had 6%, Neighbourhood A had 5.7%, and Neighbourhood C had the highest percentage by weight with 8.3%. Neighbourhood C, having the youngest and largest families, tended to generate the most packaging of plastics especially from fast food outlets.

Plastic packaging is sure to grow if the present trends in marketing continue (Baum & Parker, 1974; Cavanagh, 1985; Standinger ed., 1974; Packaging Council of Australia - 3, 1980). However, Barry Commoner of M.I.T., speaking on the ABC Science Show, stressed the hazards of burning plastics in large incinerators. He called on governments and businesses to encourage recycling by household separation of the plastics from the waste stream. The growth in plastics must be treated with great concern if the dioxins causing cancers are to be reduced (Commoner, 1986).

5.7.8 Steel

Nationally, the steel can component of the waste stream in 1981 by weight made up 7.7%. This included both beverage and food cans (Pausacker & Andrews, 1983). In Glenorchy, the steel component was 10.3%. The higher average than the national figures would be explained by the dominance of the steel cans in the Hobart region.

Tables 5-4, 5-5, and 5-6 showed Neighbourhoods B (12%) and C (11.6%) used more steel cans than Neighbourhood A (6.7%). These differences possibly can be explained by the use of more canned food and drinks in the two lower socioeconomic neighbourhoods than in Neighbourhood A. Also, it is possible that Neighbourhood A consumed more fresh foods than the other two neighbourhoods, thus eating less canned foods.

The marketing of steel cans in the Hobart area is indicated by the relatively high percentage of the steel cans in the Glenorchy waste stream compared to the national figures, with the possible exception being Perth.

The Glenorchy Waste Compositional Analysis found that the total waste for all three neighbourhoods was 5063.5 kilograms per week. The following data are broken down by neighbourhoods:

Neighborhood

A	= 1916.8 Kilograms	per household = 6.97 kilograms
B	= 1247.3	= 4.13
C	= 1899.4	= 7.48

Total 5063.5 kg/week

Total 6.09 kg/week

Translating these figures to the whole Glenorchy Municipality, using the 20:1 ratio, the weekly total of domestic waste was 101,270 kilograms or 111.6 short tonnes per week. According to the TasWastes' manager, 22 tonnes of wastes were collected per weekday or a total of 110 short tonnes per week (Personal Communication with the Manager of Tas Wastes, May 25, 1987). This is remarkably close to the amount estimated by the Glenorchy Waste Compositional Analysis, being only about 1.6 tonnes off of the actual amount of weekly waste.

The next chapter describes the recycling operation.

6 THE GLENORCHY RECYCLING OPERATION

6.1 DESCRIPTION OF THE SELECTED RECYCLABLES

The three recyclables collected in most recycling schemes have been glass, paper and aluminium cans (Friends Of the Earth, 1983; Johnson, 1986; O'Connor, 1980; Papke, 1985; and Petersen, 1983). As a result of the confirmations based on the Waste Compositional Study, the literature review, and the visits to mainland recycling schemes, it was determined that these recyclables would be the appropriate ones to concentrate on in the Glenorchy Project. Below is a description and brief rationale for the selected recyclables.

6.1.1 Glass

Glass, whether broken down as cullet, or returned as a bottle to be refilled, has the unique properties which lends itself to recycling and reuse (Harris, 1978; Stoler, 1981). However, Papke points out that even with glass' inherent recyclability, the economics of glass recycling are at best a break even situation. Papke writes

"...the costs of collecting, processing and transporting glass cullet (crushed containers) for most recycling operations are barely offset by the revenues they receive from its sale" (Papke, 1985).

However, Papke cites new possible uses for recovered cullet. For example, glasphalt, which is asphalt using 30% to 60% waste glass in a crushed aggregate, offers a potential new use. Also building and construction uses like masonry block and glasscrete, a filler in plastics, foamglas for insulation and a number of other secondary products from cullet offer increased potential markets for cullet (Papke, 1983). Most of these uses are still only marginally economical even under the most advantageous conditions. However, the current research and development offer positive incentives for glass cullet recovery. Kerbside recycling, in an effort to recover more glass, will become a component of an increasing number of municipal garbage removal contracts according to Gordon Stewart of Glass and Furnace Technology, Toronto (Stewart, 1986).

For the Glenorchy's Project, the selection of glass was made for 4 reasons: (1) the large portion of the waste stream being glass; (2) the proximity of A.C.I.'s glass manufacturing plant to St. Vincent de Paul's depot; (3) the long term potential for recycling of glass cullet; and (4) the intrinsic value of reuseable, refillable glass bottles in the waste stream.

6.1.2 Paper

Paper waste is one of the bulkiest items in the waste stream, making up about 20% by weight according to the Glenorchy Waste Compositional Analysis. It is relatively easy to separate, but heavy and bulky to move and store. Paper was selected for 4 reasons: (1) it made up 20% of the waste stream; (2) the local markets in Tasmania were available; (3) potential uses of paper were being sought; and (4) potential export of paper to southeast Asia was a possibility.

6.1.3 Aluminium

Approximately one twelfth of the earth's surface is aluminium. However, only a small proportion of the world's total can be worked economically. It is concentrated in a few high-grade natural bauxite deposits in which Australia is rich (Comalco, 1978). In terms of reusing aluminium drink cans, there has been a dramatic increase in Australia over the past decade as the prevalence of aluminium cans has spread from N.S.W. to the borders of Tasmania.

Aluminium cans were more difficult to assess as to their desirability as the third selected recyclable. First, many households did not know the difference between aluminium and steel cans. Second, the aluminium cans were in such small numbers that it requires weeks to accumulate sufficient quantities to sell. Third, aluminium cans have a low usage in southern Tasmania. However, because of its lasting qualities, aluminium is a most valuable product. Hence, smaller quantities can still be recycled profitably (Anon 2, 1981). Aluminium cans were included in the recycling project and sold to the Walkabout Workshop which in turn sold the cans to Comalco at Bell Bay in the north of Tasmania.

Recycling of aluminium cans has had a rocky road. For example, in the USA in 1970, the national average of aluminium content in the mixed municipal refuse was only 0.5% by weight of the total waste generated. However, this figure could be misleading. It appears very low compared to the amount by weight of all waste in the USA. First, the concentration of used aluminium is found in highly urbanized areas. Second, aluminium salvage value is high, despite its small percentage of the total waste stream (Testin, 1971).

The advent of the all-aluminium beverage can in the mid-1960s prompted Reynolds Metal Company to initiate a can reclamation programme in Miami, Florida. This programme consisted of local petrol stations serving as redemption centres; Dempster Dumpsters being placed in parking lots of supermarkets; and Goodwill Industries placing special collection boxes for cans (Testin, 1971).

The main conclusion of these early efforts was that the public in the USA did not participate sufficiently to justify the continuation of the programme. A normal monthly amount of 1,500 to 2,000 pounds was collected. This was an insignificant proportion of potential cans in the Miami area.

Another project was launched in early 1969 in Los Angeles, California. It differed in two ways from the Miami experience. First, the cans were turned in at a Reynolds-operated center. Second, cash at the rate of 10 cents per pound or one half cent per individual aluminium can was paid to the public and collectors. This programme achieved a break-even point of 65,000 pounds per month, which was reached in October of 1970. From the experience of these two programmes, can reclamation facilities have been established in most states in the USA (Testin, 1971).

6.2 PUBLICITY

The Glenorchy Recycling Project made good use of the questionnaire survey as a publicity technique. (The details of the publicity process are described in Chapter 4 because of the complementary nature of the questionnaire survey and publicity.) All households received a brochure prior to the start up of the collection phase of the recyclables. Because brochures are readily discarded, a follow-up brochure was distributed after 6 weeks of the first quarter. It was intentional not to spend much of the the budget on publicity so as to try and isolate the effects of the "spreading-the-word-by-example" model. Only the brochure publicity was common to all residents.

6.3 COLLECTION OF RECYCLABLES

The collection phase is the main event in any recycling scheme. St. Vincent de Paul used a driver and two runners for the collection and sorting phase. The three tonne truck was unmarked because of St. Vincent de Paul's policy of not advertising their presence in neighbourhoods where deliveries of household goods are made to needy families. Furniture deliveries and collections were the main uses of the truck. The recycling collections was a secondary use.

The first few weeks of the collection runs proved to be a time of excitement and enthusiasm. The author accompanied the driver and runners on the initial collection runs to help iron out any problems. Most of the runs took between 30 minutes to one hour. The route was from Mill Lane to and through the neighbourhood, back to the Hull Street depot for unloading and sorting of the recyclables and then a return to the Mill Lane store. This routine continued for most of the Project. Changes in runners, drivers and management added to the need to have careful supervision. When the Hull Street depot's lease was up in 1982, St. Vincent de Paul decided not to renew it but to consolidate



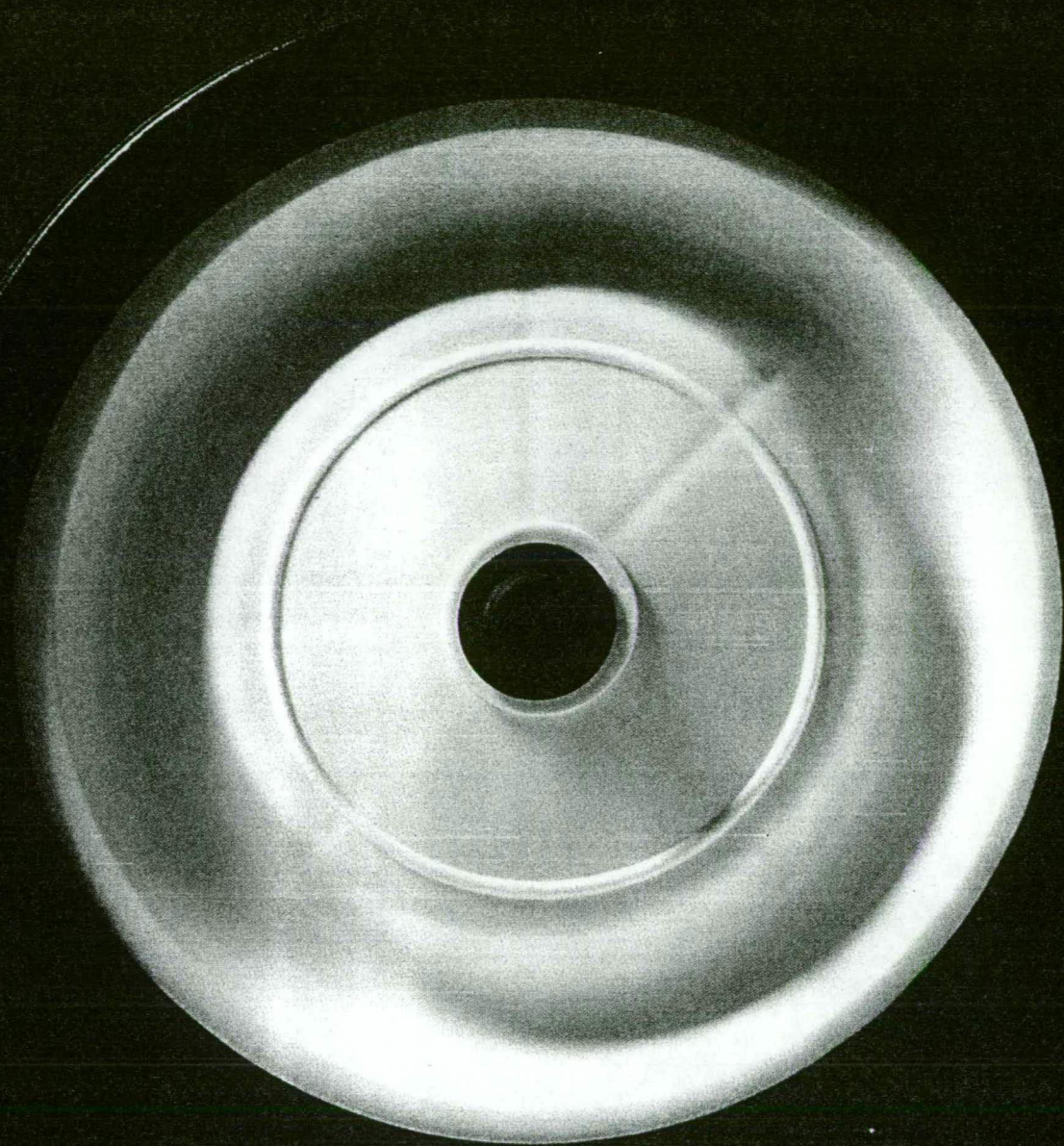
Plate 6-1

Driver and Runners Ready for Collection



plate 6-2

Runner Picking Up Newspapers



**How To Put Your
Recycling Program
On A Roll.**

the storage at the Mill Lane garage and lot. This change in sorting location was an improvement. It enabled the 20 to 30 minutes unloading time to be cut down to 10 to 15 minutes because of the better arrangement at the Mill Lane store.

As the Project continued, the enthusiasm by the runners and driver began to wane. The author tried to mitigate any potential friction between runners and management by discussing the problems and providing charts to show the progress of the Project. However, the handicapped runners needed constant supervision to carry out a defined task. This cut productivity. However, it was part of the design of the Project to include the handicapped workers. Midway through the Project a smaller truck, 1-1/2 tonnes, was used to improve efficiency and save on cost. Because the sorting and unloading were done after returning to the depot and not enroute, it was possible to maintain a steady speed enroute as the collection of the recyclables took place.

6.4 ECONOMICS OF THE RECYCLING OPERATIONS

6.4.1 Marketing and Sale of Recyclables

The marketing stage was the most critical in the whole process (Anon - 3, 1982). The sale and marketing of the recyclables was set up by the author. Because of the changing markets, especially for paper, the author had to spend time establishing new markets for the paper waste.

The glass cullet was sold fortnightly to A.C.I. on Gormanston Rd., Moonah. St. Vincent de Paul notified A.C.I. to collect the cullet when the 44 gallon drums were nearly full. A.C.I. collected and estimated the value of the cullet contained in the 44 gallon drums. A statement was prepared and payment was made by A.C.I. to St. Vincent de Paul on a monthly basis. The returnable or deposit bottles were stored until sufficient quantities made the trip to the Tasmanian Bottle Company in South Hobart worthwhile. Usually, 60 dozen of bottles were taken at one time to Tasmanian Bottle Company.

The paper was first taken to an A.P.M container on the Hammond Palmer property, Lampton Avenue, for shipment to A.P.M in Melbourne. Later in the Project when the A.P.M stopped buying the paper, Charlie Fluff and Comfortseal, two local cellulose insulation companies, began to purchase the paper and pick it up from the Mill Lane Store. This was a big improvement as it cut out the need to take the paper to another site. The paper was contained in wool bale bags, just able to be lifted by 2 men. Smorgans, in Melbourne, resumed the purchase of paper in 1984 at \$25/tonne. This arrangement in Melbourne lasted until the end of the project.

The aluminium cans were sold to the Walkabout Workshop on Clydesdale Avenue, Glenorchy. This arrangement proved satisfactory.

Table 6-1 depicts the revenue for the collection and sale of the recyclables.

TABLE 6-1

VALUE OF RECYCLABLES SOLD

GLASS

Glass Cullet -(sold to A.C.I.)	\$20.00 per tonne
Refillables - non-deposit (sold to Tasmanian Bottle Co.)	\$00.30 per dozen
Deposit Bottles (sold to Walkabout Workshops)	\$00.18 per 1 litre bottles

PAPER

(sold to APM - 1981-82	\$23.00 per tonne
to Comfortseal - 1982	\$35.00 per tonne
to Charlie Fluff - 1983-84	\$25.00 per tonne
To Smorgans - 1984)	\$25.00 per tonne

ALUMINIUM CANS

(sold to Walkabout)	\$00.01 per can
Miscellaneous Goods - these were sold in the St. Vincent de Paul's shop	

The value of cullet remained the same throughout the Project, as did the refillables and deposit bottles. However, the value of the paper waste fluctuated from \$23 to \$35 back to \$25 per tonne. All the paper collected was sold despite the changing purchasers and prices. If there were a hiatus between the collection and sale, the paper was stored until the price was established by the purchaser. Aluminium cans remained constant at \$.45 per kg, except for a brief drop to \$.35.

6.4.2 Expenditures of Recycling Operation

Table 6-2 depicts the weekly costs of the operation of the Project. The Study was premised on a low cost, low budget-on-going weekly source-separation recycling operation. The results showed that it was not economically feasible. If the calculations

If one compares the revenue generated by the Neighbourhood A and 2 other similar high neighbourhoods using the \$8.05 average times 3, there is still only \$24.15 or a shortfall of \$14.38 which is still not near the breakeven point. These data establish that recycling, even with modest expenditures, can not break even. It is only if someone or some organization is willing to subsidize the operation, that recycling house to house will be able to continue. In this case, St. Vincent de Paul unofficially subsidized the operation to the amount of about \$16.00 per week over the first 4 quarters, then about \$14.00 per week over the last 4 quarters of the Project. The study of Seattle, Washington, showed that extra publicity did not significantly increase participation rates after the initial publicity (SORT, 1980).

6.4.3 Other Costs

The data below give an indication of the amounts of recyclables collected in one year and what one could expect to collect if it were applied to the Municipality of Glenorchy.

The most valuable recyclable was glass, with deposit bottles the most lucrative of the glass.

The refillable beer and cider bottles were the second most lucrative. From the industry's viewpoint, refillables represented a sizeable investment for the Tasmanian Bottle Company. With a trippage rate of 70%, there was room for improvement (Little, 1982). However, if the refillables were not to end up as cullet, the Tasmanian Bottle Company would need to lift their prices for returned refillables. At the rate of \$.30 per dozen of refillables, an individual living 15 kilometres from the South Hobart depot, would need to sell \$6 worth of bottles to cover the cost of a 30 kilometre trip based on the cost of \$.20 per kilometre. Most residents do not generate sufficient quantities of bottles to justify a trip to the depot. The common alternative is to discard the bottles in the regular garbage collection. This alternative to source separation defeats the intentions of glass recovery. The implication is that unless a regular collection service is established, very little reuse or recycling will occur in most neighbourhoods.

Paper was valuable to a point, as long as the market was maintained. However, paper's bulk required extra storage space, handling time and headaches when the markets disappeared.

Aluminium cans was a distant third in the Glenorchy Project, and did not really add too much to the overall value of the recyclables on a weekly basis. However, aluminium will increase in value as the change from steel cans to aluminium cans occurs in the next few years.

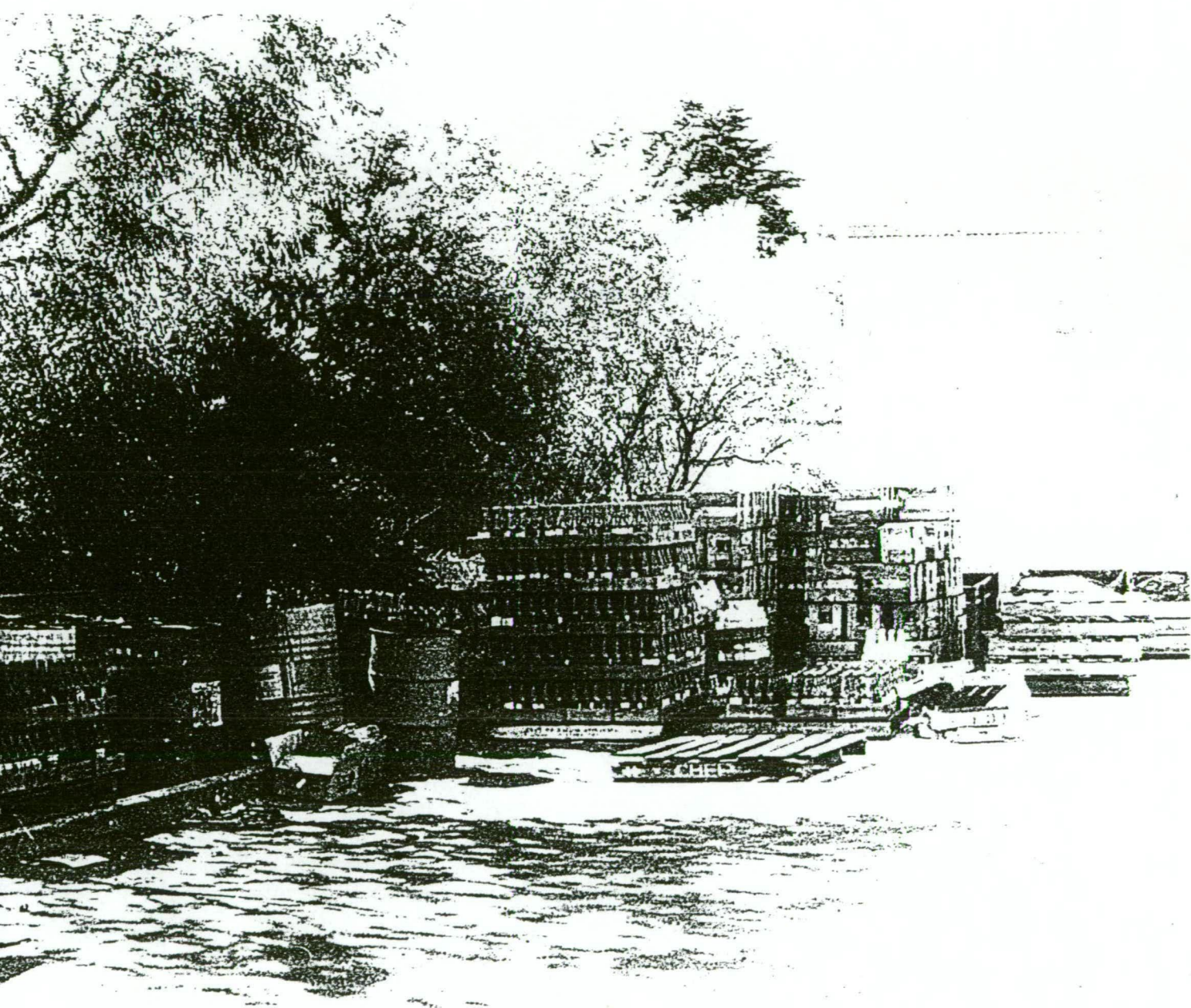


Plate 6-3

Walkabout Workshop Collection Centre - Glenorchy, Tasmania

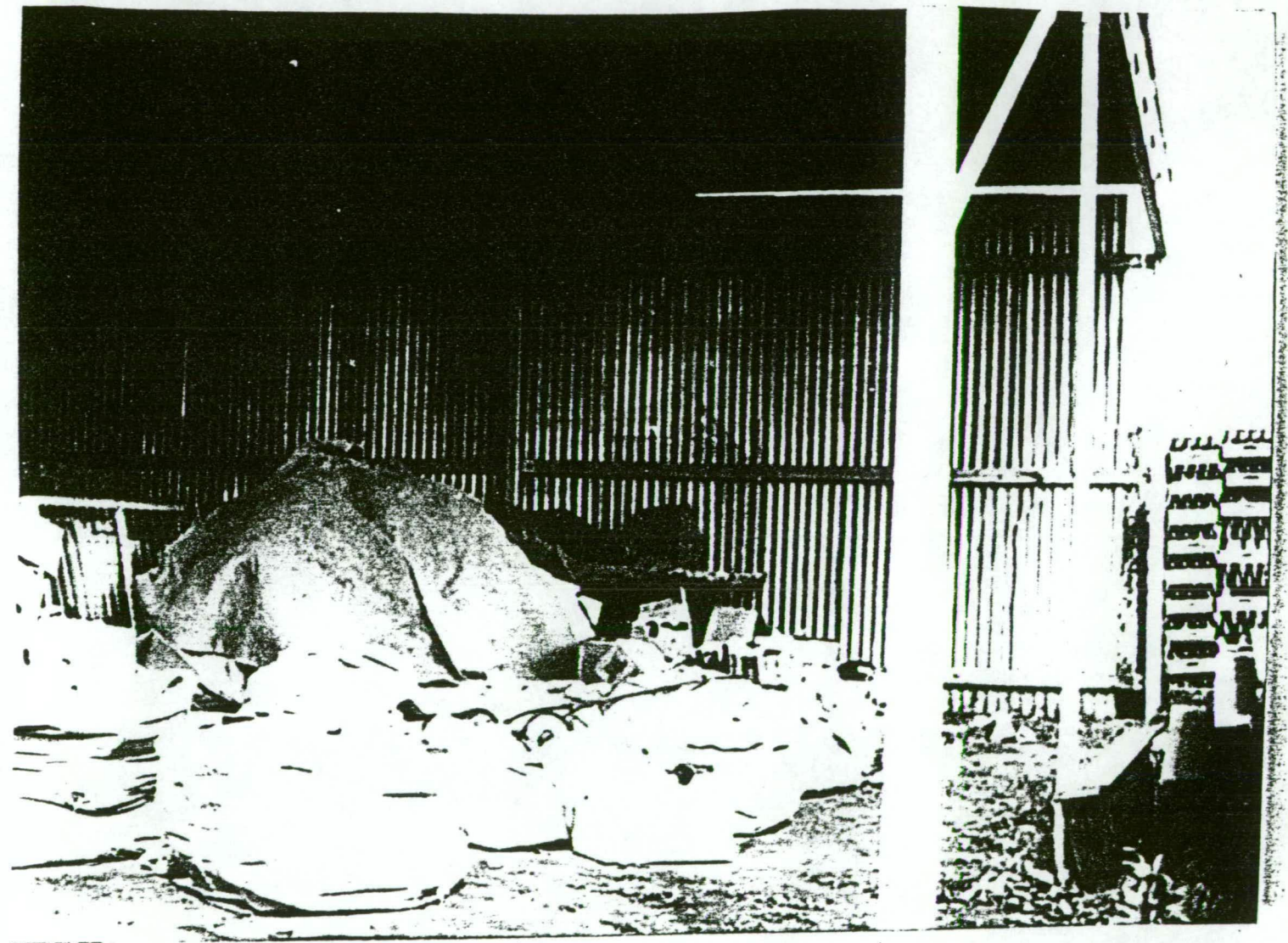


Plate 6-4

St. Vincent de Paul's Mill ST Storage Shed

Over 1 year in the 3 neighbourhoods or 900+ households, there were the following collected:

624 Dozen Beer/Cider Bottles;
468 Dozen Cordial/Deposit Bottles;
204 Dozen Aluminium Cans;
156 Bales of Paper Waste.

Translating these figures for all of Glenorchy, the estimated and expected yearly amounts are:

12,480 Dozen Beer/Cider Bottles;
9,360 Dozen Cordial/Deposit Bottles;
4,080 Dozen Aluminium Cans;
3,120 Bales of Paper per Year.

Another economic cost was to the individual householder who bore some of the costs for personal waste disposal. Many householders, 42%, said they made an occasional trip to the landfill with excess garbage. About 14.5% of the householders said they made an extra trip to the landfill weekly, while 28.3% seldom went to the landfill. Combining the frequent trippers (15%) and those (28%) making a seldom trip, a total of \$370 000 per year is the estimate of the private costs incurred by all residents in Glenorchy to dispose of the household and garden wastes privately (wastes other than the normal waste collection). Putting these costs to the whole municipality, the following data emerge;

APPLIED COST OF EXCESS TRIPS TO THE TIP FOR ALL OF GLENORCHY

FREQUENT	- \$271 440
OCCASIONAL	- \$ 88 992
SELDOM	- <u>\$ 10 188</u>
TOTAL	= \$370 620

It is recognized that some people would see going to the landfill as an outing and not as a direct cost. However in Glenorchy, unlike the eastern shore suburb of Clarence, the landfill is at the end of a dead-end road with no other option like going to a park or beach. Therefore, the figures reflect an accurate cost to the ratepayers, who must take their extra rubbish to the landfill.

A social benefit was that the Project employed 3 handicapped workers. Another social benefit was the interchange between neighbours as they casually talked of the unique recycling project. Of those householders who did respond in an informal way during the Project, the majority felt good about their recycling participation. There was an enhanced neighbourhood cohesiveness as neighbours observed each other participating in the Project.

They felt they doing something positive for their charity, neighbourhood and city.

The environmental benefit was the amount of waste recycled or diverted away from the landfill back into the recycle/reuse loop (Brown, 1978). While the sampled amounts do not appear sizeable, extrapolating the data to the entire municipality, would result in significant environmental benefits. Landfills are filling up at an increasing rate. By diverting waste from the landfill, the Council is gaining expensive landfill space for the future and at the same time protecting the environmental qualities of the community. The incomplete resource costing prevents many people from knowing what the true cost of their lifestyle is and prevents them from making a valid choice. Some of the costs such as reclamation after mining or the loss of topsoil in forests may need to be calculated to reflect the true environmental cost (Taylor, 1975; Milbrath, 1977).

6.5 STRENGTHS AND WEAKNESSES OF THE GLENORCHY RECYCLING PROJECT

One of the strengths of the recycling operation combined the publicity and the data collection into one low cost method. The project operation attempted to minimize the cost of publicity by contacting every second household rather than every household with the questionnaire. The concept was to win over a nucleus of personally contacted households so that there would remain a strong recognition factor associated with the project until the non-personally contacted households could be brought into the participation by the spreading-the-word model.

The use of St. Vincent de Paul as collector and processor of the recyclables served the dual purpose of positive recognition and assisting the working handicapped. The householders saw their recyclables being contributed to a charitable organization which was providing a community service. The recycling operations added diversity to the St. Vincent's de Paul task agenda.

One weakness of operation was the dependence on a private organization whose goals sometimes conflicted with the Study's goals. For example, the driver of the collection truck sometimes had other duties which had priority over the collection and sorting of the recyclables. Also, the handicapped workers required a high degree of supervision. The low wages of the workers help compensate for the low productivity. It is doubtful whether other workers would have even been available to collect the recyclables. Management turnovers at St. Vincent de Paul caused an interruption in the continuity of the overall enthusiasm and reliance of the workers.

6.6 PROPOSALS FOR THE IMPROVEMENTS TO THE RECYCLING OPERATION

For the test purposes of academic research, the recycling operations served their intentions. The practical aspects could have been improved by the following:

- graphics on the collection truck;
- more feedback to the householders and from the neighbourhoods;
- more efficiency at St. Vincent de Paul;
- better and more secured markets; and
- an increase in publicity every quarter may have increased participation rates.

The next chapter describes the results of the source separation trials, with data over 8 quarters on participation rates and \$ value of the recyclables.

7 RESULTS OF THE SOURCE SEPARATION RECYCLING TRIALS

INTRODUCTION

High household participation is essential in achieving a viable, self-sustaining, source separation recycling programme (Reinfeldt & Tullock, 1982). This chapter discusses the household participation data which were gathered from the three test neighbourhoods over the 2 year period. Household participation was defined as "each time a householder placed recyclables by the kerbside for collection." The household participation data were compiled on work sheets each collection day of each week of the 2 year test period. The driver ticked off each house which set out recyclables for collection. The author rode with the driver for the initial weeks to insure that an accurate tabulation was being recorded on the work sheets.

Chapter 7 is divided into 5 sections. Sections 7.1 and 7.2 detail the results of household participation compared to the \$ value of the collected recyclables. These data are followed by the quarterly participation rates, which are discussed by neighbourhood and quarter. Conclusions are given at the end of each of the five sections.

Section 7.3 discusses the participation rates of contacted households. (Contacted households are defined as those householders who were personally seen during the questionnaire survey). The data for contacted households are further refined to compare the responses of the contacted householders with what they said they would do versus what they actually did in practice over the life of the Recycling Project. The categories of 'contacted' were determined by the householders' responses to whether or not 1) they would answer the questionnaire and 2) whether or not they would participate in the Recycling Project. The different categories of responses are explained in 7.3.

Section 7.4 compares the contacted households with the non-contacted households to gauge the success of the 'spreading-the-word-by-example' model. The results are discussed at the end of 7.4.

The rationale for the analysis of household participation was to determine whether or not the 11 concepts set forth in Chapter 3 were confirmed or rejected. Section 7.5 discusses the purported and tested concepts and the implications of the results.

7.1 HOUSEHOLD PARTICIPATION RATES AND \$ VALUE OF THE COLLECTED RECYCLABLES

Section 7.1 gives an overview of household participation rates for each neighbourhood and the \$ value of collected recyclables. Tables 7-1-1 to 7-1-8 show the participation rates and the \$ values for the 3 neighbourhoods for each week of the 8 quarters. They are placed in the appropriate location of the text for easy referral. Figures 7-1 to 7-7 show the patterns of participation and \$ value of recyclables over the duration of the Project. The three concepts below are relevant to this section:

- 1) that Neighbourhood A's higher socioeconomic status would result in more confidence in householders to spread the word to other neighbours about the Recycling Project than in Neighbourhoods B or C;
- 2) that there would be a steady increase in Neighbourhood A's participation, while in B and C because of their lower social standing in the community, a slow but steady decline would result; and
- 3) that Neighbourhood A's higher purchasing power and consumption level would mean that A would generate more \$ value of recyclables than B or C.

The next part describes the data over the 8 quarters of the project.

FIGURE 7-1

AVERAGE WEEKLY PARTICIPATION RATES FOR
NEIGHBOURHOODS A,B,C, - 8 QUARTERS 1981-1983

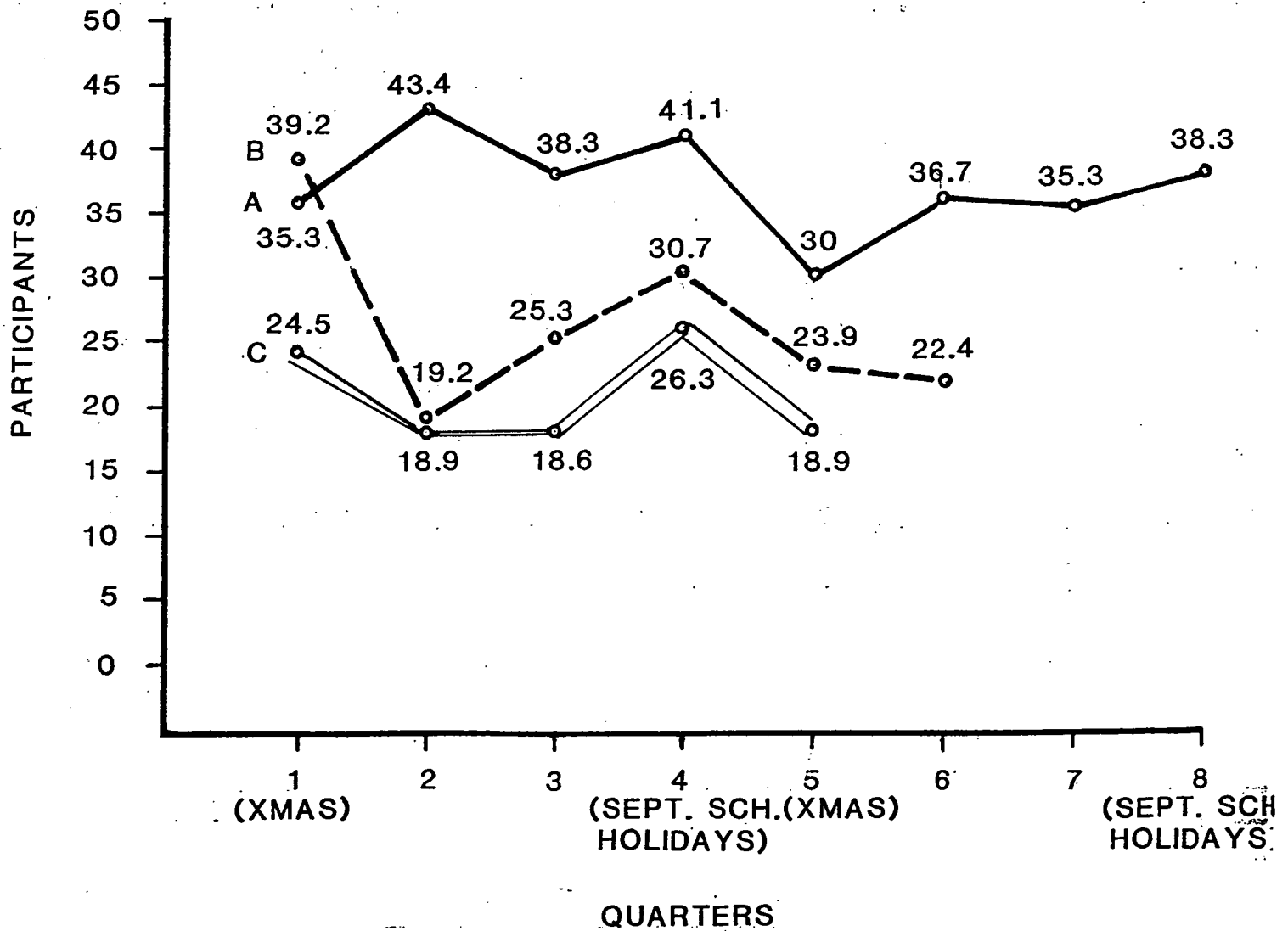


TABLE 7-1-1

THREE NEIGHBOURHOODS IN GLENORCHY, TASMANIA
WEEKLY PARTICIPATION AND \$ VALUE OF RECYCLABLES

1ST QUARTER

NEIGHBOURHOOD A			NEIGHBOURHOOD B			NEIGHBOURHOOD C		
<u>DATE</u>	<u>PART.</u>	<u>\$/VAL</u>	<u>DATE</u>	<u>PART.</u>	<u>\$/VAL</u>	<u>DATE</u>	<u>PART.</u>	<u>\$/VAL</u>
3/11/81	48	\$26.78	20/11	61	\$14.80	21/10	45	\$44.15
10/11	45	\$08.80	27/11	30	\$11.10	28/10	25	\$10.25
17/11	37	\$08.25	4/12	28	\$15.90	04/11	21	\$07.65
24/11	38	\$11.35	11/12	32	\$11.35	11/11	25	\$09.05
01/12	31	\$08.70	18/12	37	\$13.35	18/11	31	\$14.05
08/12	39	\$07.55	08/01/82	30	\$09.75	25/11	25	\$12.85
15/12	33	\$14.20	15/01	52	\$09.30	09/12	27	\$12.25
22/12	32	\$16.10	22/01	53	\$07.75	16/12	23	\$06.50
29/29	29	\$10.90	29/01	22	\$07.45	23/12	27	\$09.20
05/01/82	27	\$18.15	05/02	37	\$07.75	30/12	13	\$04.40
12/01	29	\$13.05	12/02	50	\$07.25	06/01	17	\$11.05
19/01	--	\$07.25	19/02	38	\$07.05	13/01	15	\$05.50
Totals	388	\$153.53		470	\$122.80		294	\$146.90
Means	35.3	\$12.79		39.2	\$10.23		24.5	\$12.24
Standard Deviations								
	6.5	\$5.57		11.70	\$02.96		0,8.01	\$10.03
\$ Generated Per Participating Household Per Week								
	\$.40			\$.26			\$.50	



First Quarter Data Participation Rates

Neighbourhood A had a weekly average of participants in the 1st Quarter of 35.3 or 13.1% out of the total of 270 houses. Neighbourhood B had 39.2 or 12.5% out of a total of 313 houses. Neighbourhood C had 29.4 or 11.6% out of a total of 254 houses.

In Neighbourhood A, the peak was the first week with 48 participants. This was two standard deviations higher than the mean. There was a steady decline over the 1st Quarter, with only a minor increase from week 5 to week 6 when the total went from 31 to 39 participants. As Christmas 1981 approached, the participation rates dropped and didn't increase again until January 12, 1982, which was week 11. This suggested that people probably took their summer holidays over this period and/or did not bother to set out their recyclables.

In Neighbourhood B, the peak was also the first week with 61 participants. This was two standard deviations from the mean of 39.2. There was a sharp drop the second week to 30 participants. This possibly reflected the cleaning out of the garage phenomenon. The data from the second week on showed a stable participation rate until seventh and eighth weeks, where the rate jumped up to 52 and 53, respectively. Week 9 showed a sharp drop down to 22 participants, levelling off the last week at above the average with 38 participants. The pattern of Neighbourhood B was different from Neighbourhood A in that there were two defined peaks in Neighbourhood B, while there was an overall reduction in Neighbourhood A's participants.

In Neighbourhood C, like Neighbourhood A and B, again the first week was the peak with 45 participants. It can be partially attributed to the brochure which followed the questionnaire survey and the 'clean-out' phenomenon. In the fifth week, there was a minor recovery with 31 participants recorded. Overall, there was a steady decline down to 15 for an average of only 24.5 participants. This was more than one standard deviation from the mean.

Dollar (\$) Values

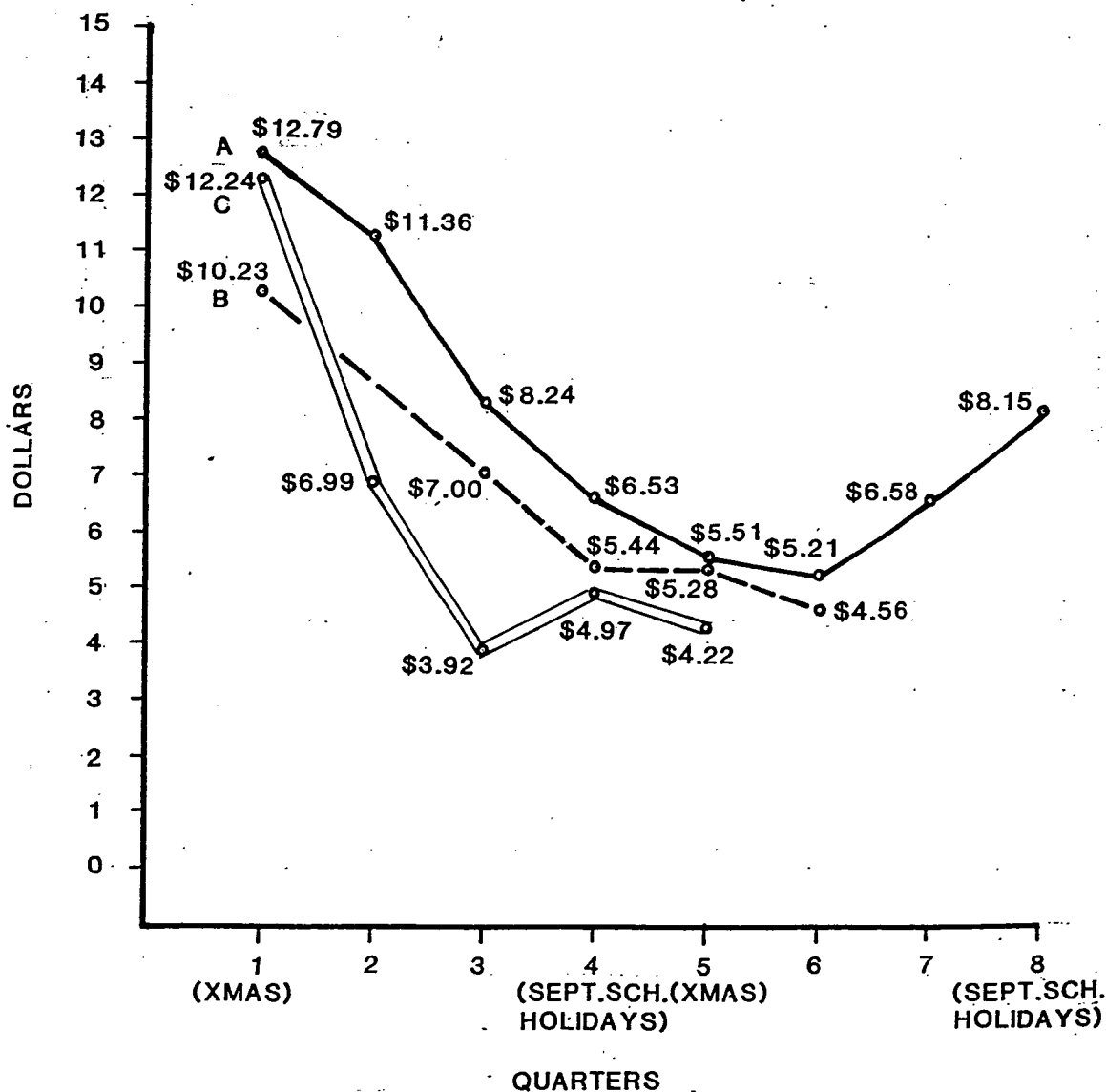
Neighbourhood A's peak \$ value correlated with its first week's peak for participants. (See Table 7-1-1) After the 1st week's \$26.78 value, there was a dip for two weeks before a return to \$13.80 in the fourth week. Another dip occurred for the next two weeks before a jump back up to \$14.20 in the 7th week. At first glance, this pattern of one high, two lows and another high week, appears to indicate that a once-a-month collection could have realized about the same monetary results as a weekly collection. However, one can not be certain that this would have been the case as householders may not have

participated if there hadn't been an every-week collection. The average weekly amount of recyclables in \$ value amounted to \$12.79, with a standard deviation from the mean of \$5.57.

Neighbourhood B's performance was less dramatic with a standard deviation of only \$2.96 from the mean of \$10.23. The overall pattern showed a stable, but slightly declining rate over the 1st Quarter. There was little relationship between the number of participants and the dollar value of recyclables. Neighbourhood B generated a \$0.26 average per participating household per week.

Neighbourhood C had \$10.03 standard deviation from a \$12.24 mean. The 1st week of the 1st Quarter was an aberration, as \$44.15 was collected in bottles and other recyclables. This amount was the result of one household's half yearly supply of bottles being collected. This figure was never approached again during the Project.

FIGURE 7-2 AVERAGE WEEKLY \$ VALUE OF COLLECTED RECYCLABLES IN NEIGHBOURHOODS A, B, C, OVER 8 QUARTERS - 1981-1983



Second Quarter Data Participation Rates

The 2nd Quarter had only 8 weeks of data for Neighbourhood A, 6 weeks for Neighbourhood B, and 10 weeks for Neighbourhood C. The gap in data was due to the driver of the collection truck abruptly quitting. Unfortunately, the author was overseas at the time and could not brief the new driver at the time.

Neighbourhood A recorded an average of 43.4 participating households per week. (See Table 7-2-1) The standard deviation from the mean was 8.1 which reflected an emerging stable pattern. Week 7's peak of 57 participants was almost two standard deviations higher than the mean. The participation figures suggested a steady rate of participation overall.

Neighbourhood B's average was 19.2 participants with a 9.8 standard deviation. These data reflected a drop from the 1st Quarter's average of 39.2 participants.

Neighbourhood C's rate of 18.9 average with only a standard deviation of 3 suggested that there was a low, but steady rate of participation.

Dollar (\$) Values

In Neighbourhood A, the average participating household was generating \$.26 per week. The average \$ value of \$11.36 per week was due partly to the few weeks of data and partly to a good quantity of recyclables. The standard deviation was \$4.41 from the mean.

In Neighbourhood B there were no data for \$ values due to the driver's absence.

Neighbourhood C had an average of \$.15 per participating household, a large drop from the 1st Quarter's average of \$.50. The standard deviation was \$1.50 from the mean of \$6.99.

FIGURE 7.3 AVERAGE WEEKLY PARTICIPATION RATES IN NEIGHBOURHOOD
A OVER B QUARTERS 1981-1983

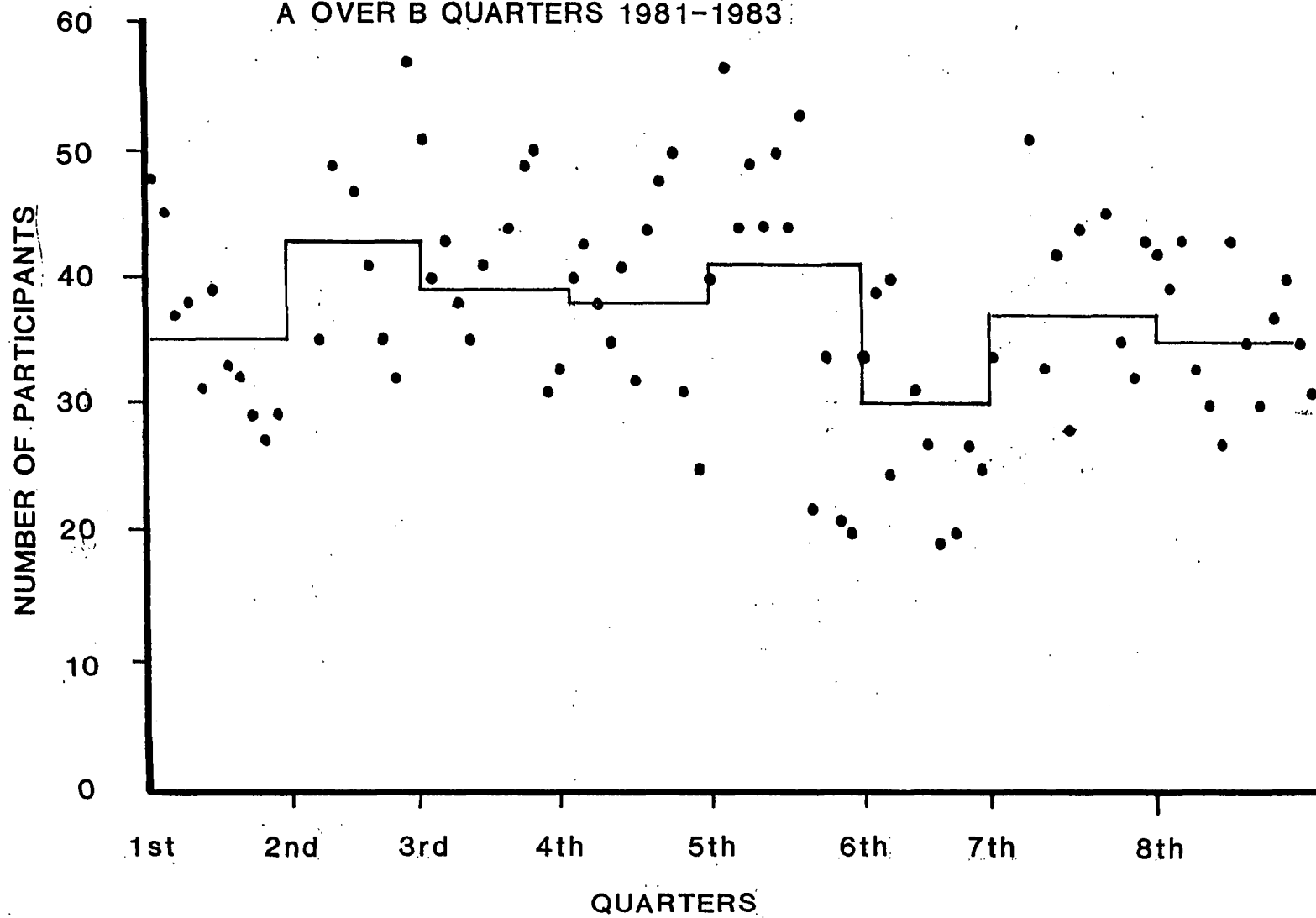


TABLE 7-1-2

THREE NEIGHBOURHOODS IN GLENORCHY, TASMANIA
WEEKLY PARTICIPATION AND \$ VALUES OF RECYCLABLES

2ND QUARTER

<u>NEIGHBOURHOOD A</u>			<u>NEIGHBOURHOOD B</u>			<u>NEIGHBOURHOOD C</u>		
<u>Date</u>	<u>Part.</u>	<u>\$Value</u>	<u>Date</u>	<u>Part.</u>	<u>\$Value</u>	<u>Date</u>	<u>Part.</u>	<u>\$Value</u>
2/02/82	35	\$07.90	26/02/82	18	-----	20/01/82	17	---
09/02	No Collection		05/03	22	-----	27/01	17	---
	Regatta Day							
16/02	49	\$08.70	12/03	34	-----	03/02	18	\$6.20
23/02	47	\$20.70	19/03	24	-----	10/13	13	\$5.95
02/03	41	-----	26/03	05	(Rain)	17/02	24	\$9.60
09/03	35	-----	02/04	--	-----	24/02	22	\$6.20
16/03	32	-----	28/05	--	-----	03/03	18	-----
23/03	57	\$09.45	04/06	--	-----	10/03	22	-----
30/03	51	\$12.45	11/06	--	-----	17/03	--	-----
-----						24/03	18	-----
26/06	--	\$08.95	-----			31/03	20	-----
<hr/>								
Totals	347	\$68.15		115			189	\$27.95
<hr/>								
Means	43.4	\$11.36		19.2			18.9	\$6.99
<hr/>								
Standard Deviations								
	8.1	\$4.41		9.8			3	\$1.50
<hr/>								
\$ Generated From Each Participating Household Per Week								
<hr/>								
		\$0.26						\$.15
<hr/>								

3rd Quarter Data Participation Rates

Neighbourhood A recorded maximum rate of 50 and a minimum of 25, for a mean of 38.3. This was a 7.1 standard deviation. The pattern was not readily recognized.

Neighbourhood B had a range from 33 participants down to 17. The mean was 25.3 with a standard deviation of 4.4. There was no apparent pattern over the quarter's weeks.

Neighbourhood C had 9 weeks of data. The range was from a low of 10 to a high in the 4th week of 26, with a mean of 18.6 and a standard deviation of 5.4. (See Table 7-1-3)

Dollar (\$) Values

Neighbourhood A scored a \$8.24 average for 7 weeks of the 3rd Quarter. (Data were not available for the other 5 weeks due to the new driver not being able to be briefed). The standard deviation was \$1.48, with an average of \$0.22 per participating household.

Neighbourhood B achieved an average of \$7.00 per week with a standard deviation of \$2.52. At this point, one might have thought that Neighbourhood B was becoming viable. The \$0.28 per participating household suggested that Neighbourhood B's collection run had a future. However, this was not to be the case as the collection run ended after the 6th Quarter.

Neighbourhood C revealed a drop to \$3.92 per week average. Despite the low total amount, Neighbourhood C still averaged \$0.21 per participating household per week. (See Table 7-1-3) The 3rd Quarter's data was the warning light that all was not well in Neighbourhood C. It was not too long afterwards that St. Vincent de Paul's management made the decision to stop collection in Neighbourhood C.

Neighbourhood C experienced an average of 18.6 participants, with a standard deviation of 5.4. The data were beginning to reflect the drop in participation rates.

TABLE 7-1-3

THREE NEIGHBOURHOODS IN GLENORCHY, TASMANIA
WEEKLY PARTICIPATION AND \$ VALUE OF RECYCLABLES

3RD QUARTER

NEIGHBOURHOOD A NEIGHBOURHOOD B NEIGHBOURHOOD C

Date Part. \$/Value Date Part. \$/Value Date Part. \$/Value

08/06/82	33	----	18/06/29	\$14.19	26/05/10	\$03.30
15/6	40	----	25/06/20	\$05.92	09/06/24	\$03.45
22/6	43	----	02/07/23	\$03.62	16/06/10	\$01.20
29/6	38	----	09/07/25	\$05.44	23/06/26	\$05.46
06/7	35	----	16/07/22	\$05.71	30/06/20	\$01.60
13/7	41	\$8.43	23/07/17	\$05.99	07/07/23	\$05.02
20/7	32	\$6.13	30/07/24	\$07.72	14/07/20	\$08.49
27/7	44	\$7.17	06/08/33	\$06.47	21/07/16	\$03.43
03/8	48	\$10.32	13/08/26	\$05.29	28/07/18	\$03.30
10/8	50	\$09.53	20/08/31	\$07.59	-----	-----
17/8	31	\$09.41	27/08/25	\$07.86	-----	-----
24/8	25	\$06.70	03/09/28	\$08.16	-----	-----

Totals 460 \$57.69 303 \$83.96 167 \$35.25

Means 38.3 \$8.24 25.3 \$07.00 18.6 \$03.92

Standard Deviations

7.1 \$1.48 4.4 \$2.52 5.4 \$2.04

\$ Value Generated From Each Participating Household Per Week

\$.22 \$.28 \$.21

4th Quarter Data Participation Rates

The spring quarter of 1982 saw a slight increase in participation averages for all neighbourhoods. The 4th Quarter marked a milestone in that the project was sustained on its own steam for one year with growth in the participation rates. (See Table 7-1-4)

Neighbourhood A's weekly average of participating households was 41.1 with a large standard deviation of 10.4. (See Table 7-1-4)

Neighbourhood B recorded a 30.7 average with a 10.9 standard deviation from the mean. The peak of the 4th Quarter was in week 2 at the end of the September school holidays. September is not the most popular time for vacationing in Tasmania. The weather can be cold and windy. It is spring time when people clean out their garages. This could explain the large response in the 2nd week. The figure of 60, an aberration, is about 3 standard deviations from the average.

Neighbourhood C scored its peak in the September school holidays in Week 7 with 42 participants. The average was still only 26.3 participants with a standard deviation of 8.1.

Dollar (\$) Values

Neighbourhood A generated the largest average with \$6.53 and \$3.76 for the standard deviation. A September holiday peak was recorded in the 2nd week with a large \$17.88, or about 4 standard deviations from the average of \$6.53.

Neighbourhood B achieved a \$5.44 average with a standard deviation of \$1.39. There was a strong relationship in the 2nd week between number of participants and amount of recyclables.

Neighbourhood C's average was \$4.97. The standard deviation was \$1.46. Neighbourhood C had the highest figure with \$0.19 per participating household, with Neighbourhood B having \$0.18 and Neighbourhood A having only \$0.16. However, looking at the total of the whole neighbourhood, Neighbourhood A had a higher total in actual dollars per week because of its higher participation rate.

FIGURE 7.4 AVERAGE WEEKLY PARTICIPATION RATES IN NEIGHBOURHOOD B OVER 6 QUARTERS 1981-1983

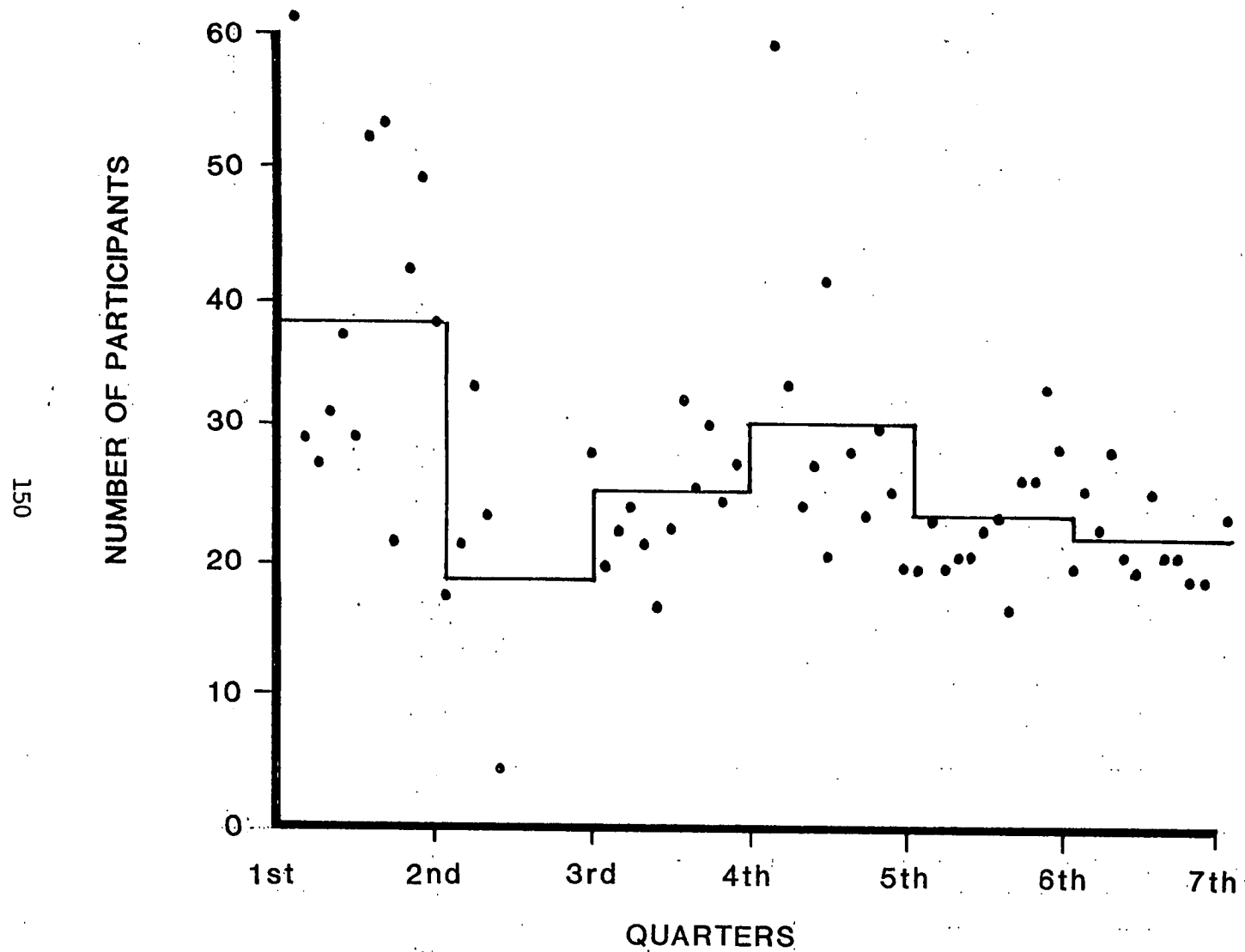


TABLE 7-1-4

THREE NEIGHBOURHOODS IN GLENORCHY, TASMANIA
WEEKLY PARTICIPATION AND \$ VALUE OF RECYCLABLES

4Th QUARTER

NEIGHBOURHOOD A			NEIGHBOURHOOD B			NEIGHBOURHOOD C		
<u>Date</u>	<u>Part.</u>	<u>\$/Value</u>	<u>Date</u>	<u>Part.</u>	<u>\$/Value</u>	<u>Date</u>	<u>Part.</u>	<u>\$/Value</u>
31/8/82	40	\$05.75	10/9	28	\$06.92	4/8	24	\$04.14
7/9	57	\$17.88	17/9	60	\$08.87	11/8	30	\$05.84
14/9	44	\$08.13	24/9	34	\$05.40	18/8	18	\$03.74
21/9	49	\$09.01	1/10	25	\$03.31	25/8	34	\$07.80
28/9	44	\$06.06	08/10	28	\$06.75	1/9	34	\$07.76
05/10	50	\$05.45	15/10	42	\$03.31	8/9	13	\$03.15
12/10	44	\$04.91	22/10	21	\$04.11	15/9	42	\$04.46
19/10	53	\$04.95	29/10	29	\$04.85	22/9	29	\$05.71
27/10	27	\$04.31	5/11	24	\$04.65	29/9	25	\$04.08
2/11	34	\$04.43	12/11	31	\$04.24	6/10	29	\$04.80
9/11	26	\$04.07	19/11	26	\$04.41	13/10	15	\$03.79
16/11	25	\$03.45	26/11	20	\$04.45	20/10	23	\$04.34
Totals	493	\$78.40		368	\$65.27		316	\$59.61
Means	41.1	\$6.53		30.7	\$5.44		26.3	\$4.97
Standard Deviations								
	10.4	\$3.76		10.9	\$1.39		8.1	\$1.46
\$ Value Generated From Each Participating Household Per Week								
	\$.16			\$.18			\$.19	

5th Quarter Data Participation Rates

The 5th Quarter recorded an overall drop in participation rates. This summer quarter was the start of the second year's data.

Neighbourhood A dropped down to an average of 30 participants per week. (See Table 7-1-5) Despite this drop, Neighbourhood A was still out in front of Neighbourhood B's 23.9 and Neighbourhood C's 18.9. For Neighbourhood A, the pre-Christmas peak in week 4 tended to confirm the Christmas and New Year's break as the normal holiday period. There was a post-holiday period of late January and early February when residents again started to clean out before the school season began.

Neighbourhood B's average participation rate was 23.9, with a standard deviation of 4.3. The situation in Neighbourhood B, with its older and less mobile population, reflected a more even period of participation.

Neighbourhood C's participation rate was erratic with a standard deviation of 7.4 from the mean of 18.9. This represented a drop from the previous quarter's figure of 26.3. It was after this quarter that St. Vincent de Paul's management decided that collection in the Claremont Neighbourhood (C) was no longer economically viable.

Dollar (\$) Values

Neighbourhood A generated a \$5.51 average \$ value per week which had a standard deviation of \$1.00. The amount per participating household was \$0.18.

Neighbourhood B produced a weekly average of \$5.28, not much below Neighbourhood A's total. The standard deviation was only \$0.80. It meant a fairly even \$ value each week.

In Neighbourhood C, the weekly \$ value was only \$4.22, with a standard deviation of \$0.86. However, despite the \$0.22 average per participating household, the margin for the whole neighbourhood had fallen below what the St. Vincent de Paul's management thought was viable. This proved to be the last quarter for collection in Neighbourhood C.

FIGURE 7.5 AVERAGE WEEKLY PARTICIPATION RATES IN
NEIGHBOURHOOD C OVER 5 QUARTERS 1981-1983

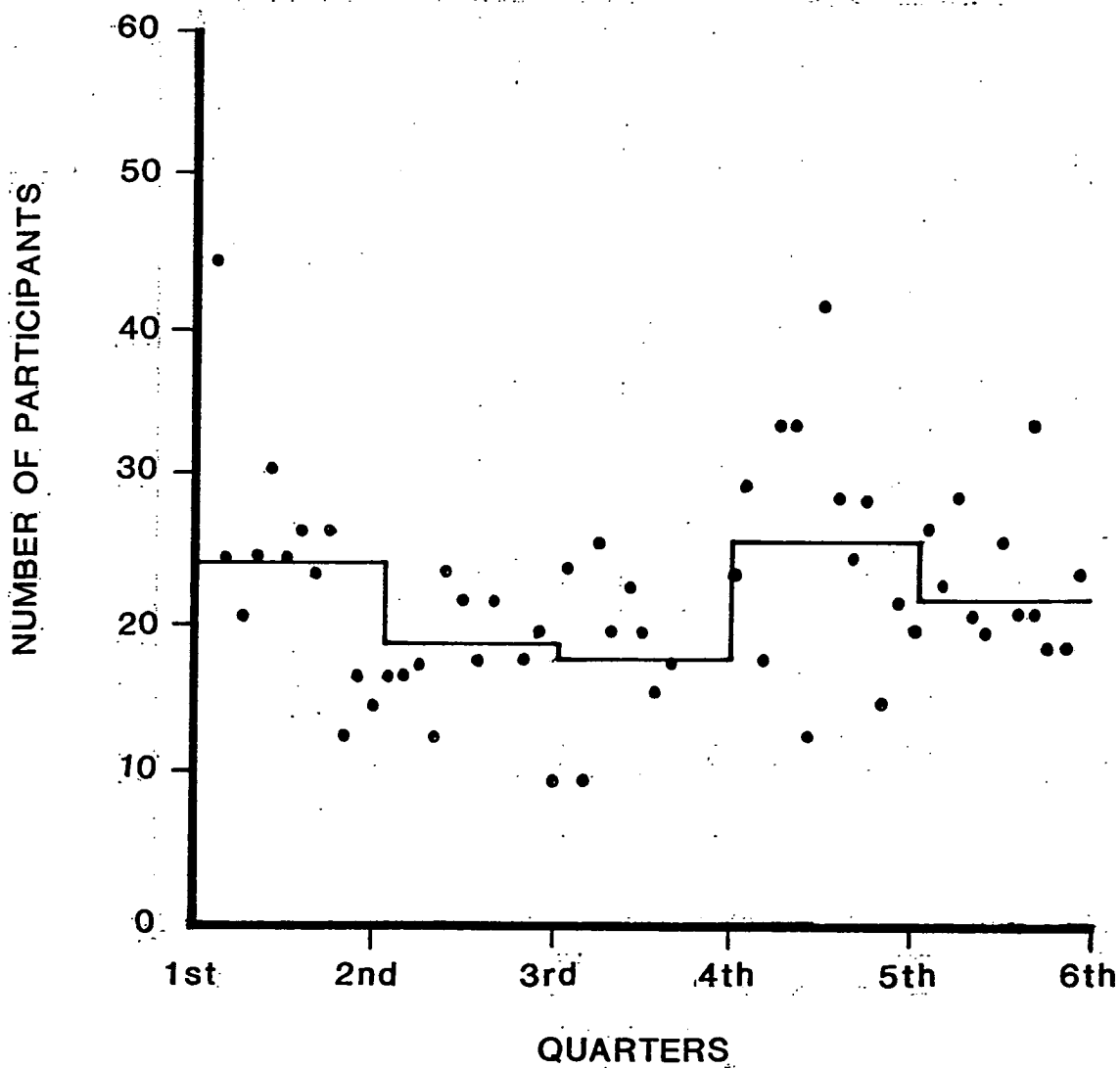


TABLE 7-1-5

THREE NEIGHBOURHOODS IN GLENORCHY, TASMANIA
WEEKLY PARTICIPATION AND \$ VALUE OF RECYCLABLES

5TH QUARTER

NEIGHBOURHOOD A			NEIGHBOURHOOD B			NEIGHBOURHOOD C		
<u>Date</u>	<u>Parti.</u>	<u>\$Value</u>	<u>Date</u>	<u>Parti.</u>	<u>\$Value</u>	<u>Date</u>	<u>Parti</u>	<u>\$Value</u>
23/11/82	34	\$06.22	3/12	20	\$04.18	27/10	10	\$03.58
30/11	34	\$06.10	10/12	24	\$05.73	3/11	35	\$05.17
7/12	39	\$04.80	17/12	20	\$04.92	10/11	19	\$05.40
14/12	40	\$04.92	14/1/83	21	\$06.02	17/11	18	\$04.18
21/12	31	\$05.72	21/1	21	\$06.16	24/11	24	\$03.69
4/1/83	27	\$05.72	28/1	23	\$04.51	1/12	12	\$03.15
11/1	19	\$05.19	4/2	24	\$06.06	8/12	12	\$04.10
18/1	20	\$05.56	11/2	17	\$04.22	15/12	23	\$03.60
25/1	27	\$07.72	25/2	27	\$04.68	22/12	25	\$04.80
1/2	25	\$04.39	4/3	27	\$04.52	5/1/83	19	\$05.90
8/2	--	-----	11/3	34	\$06.12	12/1	17	\$03.63
15/2	34	\$07.22	18/3	29	\$06.22	19/1	13	\$03.40
Totals	330	\$60.61		287	\$63.34		227	\$50.60
Means	30	\$05.51		23.9	\$05.28		18.9	\$04.22
Standard Deviations								
	6.7	\$1.00		4.3	\$0.80		7.4	\$0.86
\$ Value Per Participating Household Per Week								
	\$.18			\$.22			\$.22	

6th Quarter Data
Participation Rates

This quarter was the second autumn quarter. In Neighbourhood C, there was no collection.

Neighbourhood A averaged 36.7 weekly participants, with a standard deviation of 10.9. In week 6, there were only 9 participants over the Easter period, which caused a much higher fluctuation in the data. It is important to note that the following week the participants were back with a total of 45. (See Table 7-1-6)

Neighbourhood B's data indicated an overall drop to 22.4 weekly average, with a small standard deviation of 3.2. These data indicated a levelling off in participation rates. It was partially because Neighbourhood B was close to St. Vincent de Paul's depot that it continued to remain viable. However, the handwriting was on the wall for Neighbourhood B. The participation rates confirmed that Neighbourhood B was on the verge of being discontinued.

Dollar (\$) Values

Neighbourhood A averaged \$5.21 per week from an average of 36.7 participants. The standard deviation was \$1.04.

Neighbourhood B generated a \$4.56 weekly average from 22.4 participants. From this, it was clear that the residents in Neighbourhood B were putting more recyclables out per participating household but less as a neighbourhood. The standard deviation was \$0.62.

FIGURE 7.6 NEIGHBOURHOOD A \$ VALUE OF RECYCLABLES OVER 8 QUARTERS 1981-1983

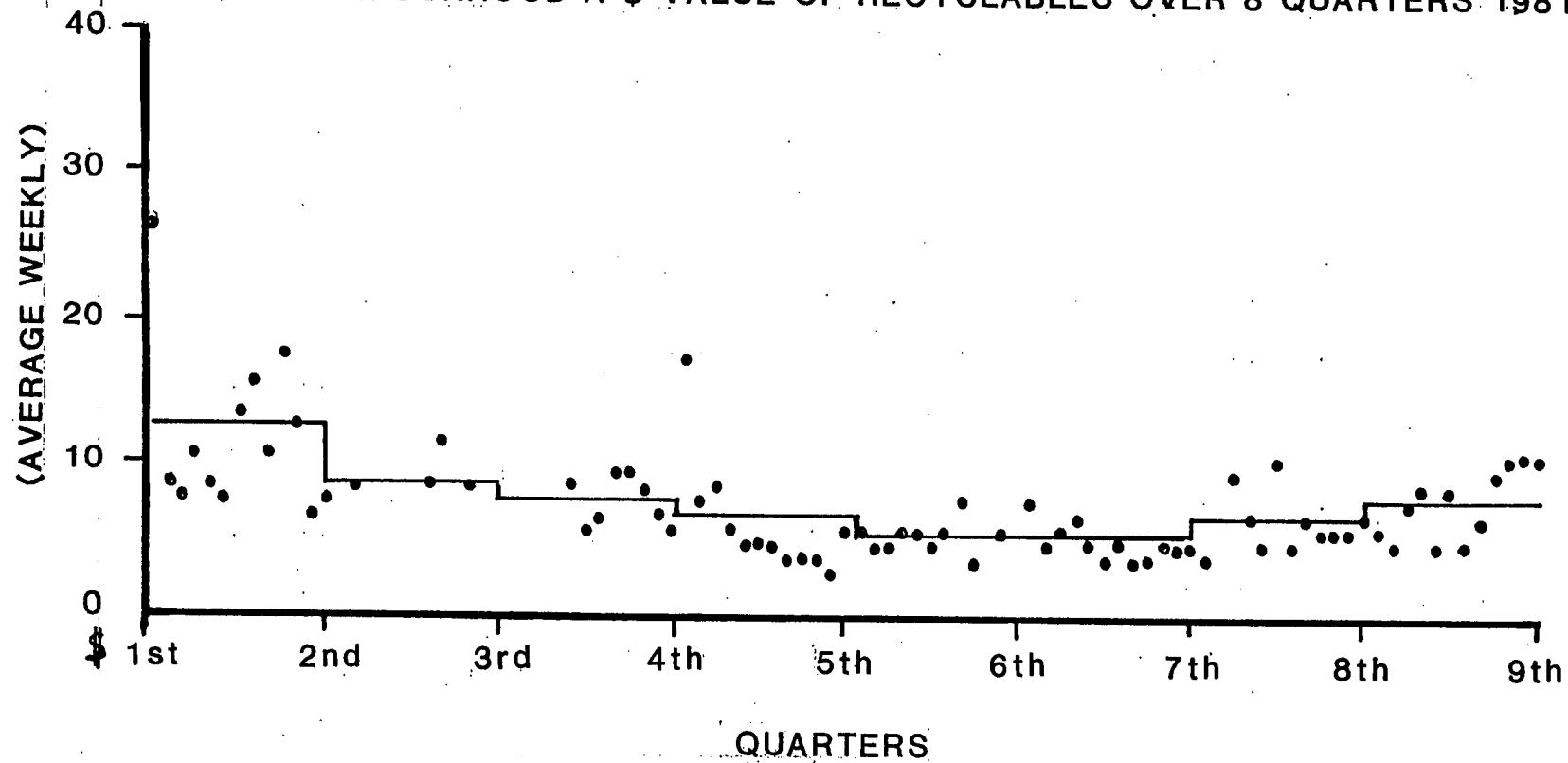


TABLE 7-1-6

TWO NEIGHBOURHOODS IN GLENORCHY, TASMANIA
WEEKLY PARTICIPATION AND \$ VALUE OF RECYCLABLES

6TH QUARTER

NEIGHBOURHOOD A			NEIGHBOURHOOD B			NEIGHBOURHOOD C
Date	Parti.	\$Value	Date	Parti.	\$value	(no collection)
22/2/83	--	----	25/3/83	20	\$4.26	
1/3	51	\$7.52	8/4	26	\$5.72	
8/3	33	\$5.22	15/4	23	\$4.36	
15/3	42	\$5.72	22/4	29	\$5.22	
22/3	27	\$6.72	29/4	21	\$4.54	
29/3	44	\$5.30	6/5	20	\$5.32	
5/4	09	\$4.23	13/5	26	\$4.15	
12/4	45	\$4.65	20/5	21	\$4.17	
19/4	35	\$3.79	27/5	21	\$5.00	
26/4	33	\$4.36	3/6	19	\$4.57	
5/5	43	\$5.19	10/6	19	\$3.58	
10/5	42	\$4.56	17/6	24	\$3.77	
Totals	404	\$57.26		269	\$54.66	
Means	36.7	\$05.21		22.4	\$04.56	
Standard Deviations						
	10.9	\$1.04		3.2	\$.62	
\$ Value Per Participating Household Per Week						
		\$.14			\$.20	

7th Quarter Data
Participation Rates

After Quarter 6, St. Vincent de Paul decided that it was not viable to continue the collection in Neighbourhood B. The total neighbourhood amount had fallen below the \$5 per week mark and it appeared to St. Vincent de Paul that the return in recyclables was no longer worth the effort. Hence, there are data only for Neighbourhood A for the 7th Quarter.

Neighbourhood A almost maintained its weekly participation average with only a slight decrease to 35.3. The standard deviation was 5.2 which represented a consistent pattern. (See Table 7-1-7)

Dollar (\$) Values

Neighbourhood A increased its weekly average to \$6.58, up from the 6th Quarter's figure of \$5.21. The standard deviation was \$2.03.

The key result was the continued viability of Neighbourhood A's total amount. The \$6.58 per week was sufficient encouragement for St. Vincent de Paul to continue the collection run.

FIGURE 7.7. NEIGHBOURHOOD C \$ VALUE OF RECYCLABLES
OVER 5 QUARTERS 1981-1983

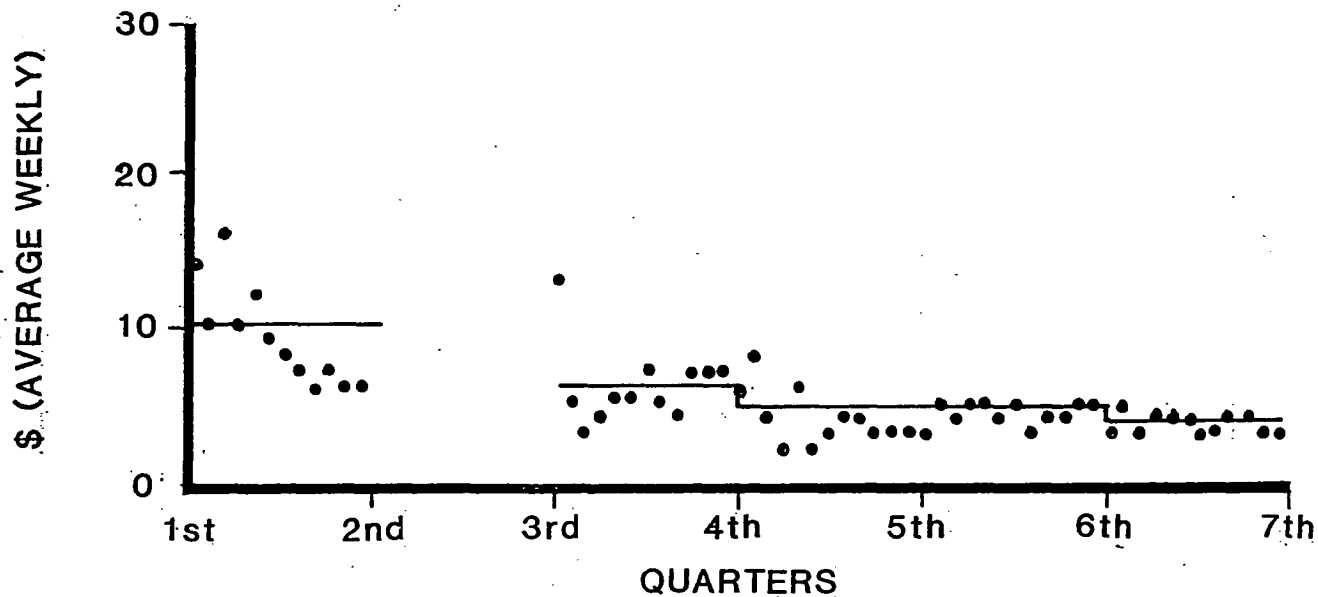


FIGURE 7.8 NEIGHBOURHOOD C \$ VALUE OF RECYCLABLES
OVER 5 QUARTERS 1981-1983

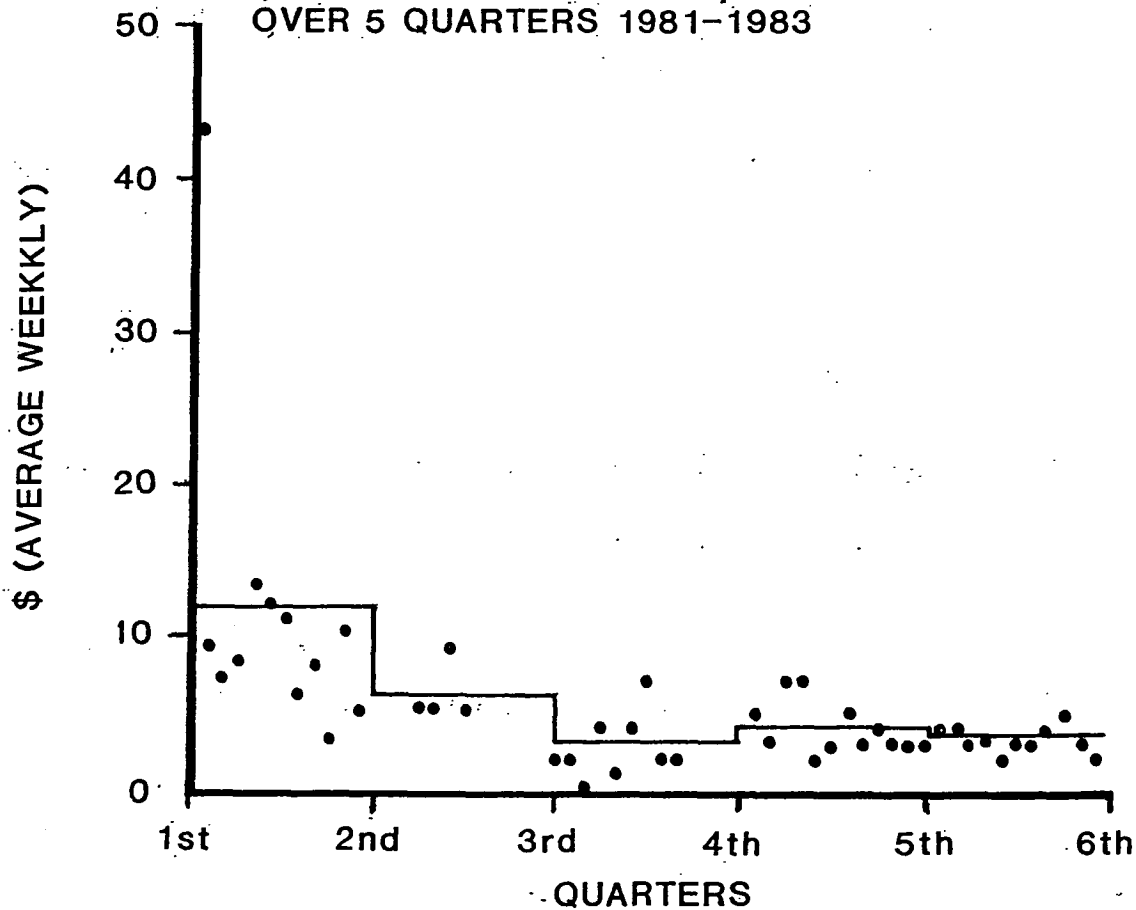


TABLE 7-1-7

ONE NEIGHBOURHOOD IN GLENORCHY, TASMANIA
WEEKLY PARTICIPATION AND \$ VALUE OF RECYCLABLES

7TH QUARTER

NEIGHBOURHOOD A			NEIGHBOURHOOD B	NEIGHBOURHOOD C
DATE	PARTI.	\$VALUE	(NO COLLECTION)	(NO COLLECTION)
17/5/83	39	\$5.00		
24/5/83	43	\$4.00		
31/5/83	33	\$10.00		
7/6	30	\$7.00		
14/6	27	\$5.00		
21/6	43	\$11.00		
28/6	35	\$5.00		
5/7	30	\$7.00		
12/7	37	\$6.00		
19/7	40	\$6.00		
26/7	35	\$6.00		
2/8	31	\$7.00		
TOTALS	432	\$79.00		
MEAN	35.3	\$6.58		
STANDARD DEVIATION				
	5.2	\$2.03		
\$ VALUE PER PARTICIPATING HOUSEHOLD PER WEEK				
\$.19				

TABLE 7-1-8

ONE NEIGHBOURHOOD IN GLENORCHY, TASMANIA
WEEKLY PARTICIPATION AND \$ VALUE

8TH QUARTER

<u>NEIGHBOURHOOD A</u>			<u>NEIGHBOURHOOD B</u>	<u>NEIGHBOURHOOD C</u>
<u>DATE</u>	<u>PARTI.</u>	<u>\$VALUE</u>	(NO COLLECTION)	(NO COLLECTION)
9/8/83	30	\$05.72		
16/8	37	\$05.12		
23/8	36	\$08.40		
30/8	36	\$09.03		
6/9	16	\$04.75		
13/9	49	\$09.06		
20/9	32	\$05.49		
27/9	36	\$07.32		
18/10	36	\$10.20		
25/10	38	\$10.95		
1/11	34	\$10.60		
8/11	44	\$11.10		
TOTALS	460	\$97.74		
MEAN	38.3	\$8.15		
STANDARD DEVIATION				
	8.1	\$2.29		
<u>\$ VALUE PER PARTICIPATING HOUSEHOLD PER WEEK</u>				
		\$0.21		

8th Quarter Data
Participation Rates

The final quarter of data showed a continuing increase in participation in Neighbourhood A. The 38.3 weekly average (See Table 7-1-8) was an increase from Quarter 7's figure of 35.3. The standard deviation was up to 8.1 from 5.2. Neighbourhood A householders continued to participate at a moderate level to justify the continuation of the collection.

\$ Dollar Value

The final Quarter for \$ figures in Neighbourhood A saw a large increase to \$8.15. Over the final 4 weeks, an overall average of \$10.00 per week was reached. The average participating householder's value of recyclables was up to \$.21 per week. The final Quarter's value was close to the \$100.00 mark.

DISCUSSION OF RESULTS (7.1) - HOUSEHOLD PARTICIPATION RATES AND \$ VALUES

Table 7-1-9 depicts the three neighbourhoods for the length of the Project by quarter. The 1st Quarter had the highest participation figures over the duration of the Project. The 4th Quarter was the 2nd highest quarter for participation rates on a total basis.

TABLE 7-1-9

AVERAGES OF HOUSEHOLD PARTICIPATION AND \$ VALUE PER QUARTER
IN THREE NEIGHBOURHOODS OF GLENORCHY, TASMANIA

NEIGHBOURHOOD A			NEIGHBOURHOOD B			NEIGHBOURHOOD C			TOTALS	
PARTI. \$VALUE			PARTI. \$VALUE			PARTI. \$VALUE			PARTI. \$VALUE	
1ST	35.3	\$12.79	39.2	\$10.23		24.5	\$12.24		99.0	\$35.26
2ND	43.4	\$11.36	19.2	-----		18.9	\$06.99		81.5	\$18.35
3RD	38.3	\$08.24	25.3	\$07.00		18.6	\$03.92		82.2	\$19.16
4TH	41.1	\$06.53	30.7	\$05.44		26.3	\$04.97		98.1	\$16.94
5TH	30.0	\$05.51	23.9	\$05.28		18.9	\$04.22		72.8	\$15.00
6TH	36.7	\$05.21	22.4	\$04.56		-----	-----		59.1	\$09.77
7TH	35.3	\$06.58	-----	-----		-----	-----		35.3	\$06.58
8TH	38.3	\$08.15	-----	-----		-----	-----		38.3	\$08.15
Tot	37.3	\$08.05	26.8	\$06.50		21.4	\$06.47		70.8	\$16.15

The composite figures for the quarters of both participation rates and \$ values show a pattern of a high 1st Quarter for all three neighbourhoods. There was a decline until the 7th Quarter in \$ values and until the 6th Quarter in participation rates for Neighbourhood A. Neighbourhood B had an overall decline in both \$ value and participation until the Project ended. Neighbourhood C had a decline for 2 quarters until a slight gain in the 4th Quarter before the Project was ended in C.

Overall for all neighbourhoods, there was a steady decline with the exception of a slight increase in the 3rd Quarter. Increased publicity at the 2nd, 4th and 6th Quarters may have been useful in forestalling the decline. However, part of the test of the Study was to measure how a low-key publicity approach would produce viable results for participation and \$ values.

Figure 7-1 shows the average weekly participation rates for the 3 test neighbourhoods. Figure 7-2 shows the average weekly \$ values of collected recyclables for the 3 test neighbourhoods. Both figures 7-1 and 7-2 show Neighbourhood A ahead in both \$ values and participation rates.

Figures 7-3, 7-4 and 7-5 show the average weekly participation rates for each neighbourhood separately. The scattered pattern for Neighbourhood A shows the weekly changes and the ranges of participation.

Figures 7-6, 7-7 and 7-8 depicts the \$ value of the recyclables for each neighbourhood. The patterns reveal a much less scattered range of \$ values over the quarters.

DISCUSSION

Neighbourhood A

The participation rates for Neighbourhood A hovered around the 35 to 40 mark for most of the 8 quarters. The average was 37.3 participants. Neighbourhood A scored significantly above B's 26.8 and C's 21.4 over the life of the Project. (see Table 7-1-9)

The seasonal highs tended to be in the spring months from September to November in Neighbourhood A. The seasonal lows tended to be around Christmas and early January, with a secondary low around Easter.

The first weeks of the Project recorded the highest rates of participation due to the cleaning out of the garages by the residents with their accumulation of recyclables. In Neighbourhood A, the first week of the First Quarter was the highest in \$ value, which reflected the questionnaire survey and the first brochure publicity. The first week's totals were never approached again during the Project. This reinforces the idea that it is difficult to predict the success of recycling projects based the first week's data.

The end of the September school holiday was generally a good participation time as people were getting ready for the 3rd term of the school year. The two week break between school terms gave people a chance to clean out their garages of recyclables during their spring cleaning. This was also a higher than average period of participation. This also reflected the pre-school term garage of participation.

Neighbourhood A averaged per week only \$8.05 worth of recyclables over the 8 quarters of the Project. (See Table 7-1-9)

Over time, there was a steady drop overall down to \$5.21 average \$ value and then a pickup in the 7th Quarter as the Project was coming to an end.

Figure 7-2 shows that after the initial weeks of the 1st Quarter, the pattern for \$ value was a steady decline for all neighbourhoods until the 6th Quarter in A when the curve was starting an upward movement again. Only A sustained enough

participants to keep the project going over the full 8 quarters.

The data show that even in the highest socioeconomic neighbourhood, A, the amount of income was marginal. It never dropped below \$5, but for the 5th and 6th Quarters, the weekly averages dropped to \$5.51 and \$5.21, respectively. It is useful to note that at the end of the 8th Quarter, a pickup in both participation and \$ values was occurring. This reinforced the rationale to continue the data collection for the 2 year period.

Neighbourhood A did stay consistently above the 30 mark for total participation in each quarter. This was both higher and more consistent than B, which only reach 30 twice over the 6 quarters before the collection was phased out. All three neighbourhoods' decline was temporarily reversed in the 4th Quarter when the participation rate went up to 98.1.

There was not a steady gain in participation in A as was hypothesized. Rather, there was only an irregular up and down rate of participation, with the 2nd Quarter being the highest. Neighbourhood A's participation was consistent over the life of the Project, never dropping below 30 but never going above 44.

Neighbourhood A did generate more \$ value of recyclables in each of the 8 quarters than B or C. The concept that A would generate more \$ value than B or C over the duration of the Project was confirmed.

Neighbourhood B

Neighbourhood B started slightly higher than A, but fell off more quickly. In B, there was usually one high quarter followed by 2 low quarters over the life of the Project.

Generally, the more participants, the higher the \$ value was for recyclables. However, it didn't always follow. Neighbourhood B did not consistently produce the relationship of more participants, the higher the \$ value of recyclables. Other exceptions were in the 4th Quarter when the participation rates were up, and the \$ values were down in all 3 neighbourhoods. (See Figures 7-1 and 7-2).

When St. Vincent de Paul made their decision to cease collecting in Neighbourhood B and C, the \$ value of collected recyclables was not much lower than that of A. This meant that other variables like distance to C and the St. Vincent de Paul's management's perception that C and B were not going to improve, influenced the decision to stop collection in C and B.

In Neighbourhood B, there was a sharp decline from the 1st to the 2nd Quarter, from 39.2 to 19.2. This was followed by a slight increase in the 3rd Quarter and a 30.7 participation rate in the 4th Quarter. However, the 5th and 6th Quarters did see a decline down to 22.4, which eventually caused the cessation of

the collection in B.

For B, there was a steady decline in \$ value from a high of \$10.23 in the 1st to \$4.56 in the 6th and last quarter. Ultimately, the combination of a drop in participation and \$ value caused the end of collection in B.

Neighbourhood B may have survived beyond the 6th Quarter. However, the large numbers of older residents with only a small amount of recyclables proved to be one of the main reasons that B did not continue to generate sufficient amount of recyclables. Also, B tended to have too many non-residential land uses to give it a feeling of a tight-knit residential community. Hence, there was not the same influence on non-participating neighbours by participating neighbours as in Neighbourhood A.

Neighbourhood C

Neighbourhood C followed B's path at a lower overall rate of participation. In C, there was usually one high, followed by 2 low quarters, then back up to the 1st Quarter's average and finally a decline in the 5th which proved to be the last quarter.

Neighbourhood C's highest quarter was the 4th. If the 5th Quarter had continued to show an increase in participation, C may have been continued, but it fell to 18.9 average weekly participation rate in the 5th Quarter. This resulted in the decision to cease collection in C.

Neighbourhood C dropped from a weekly average of \$12.24 to \$6.99 from the 1st to 2nd Quarters. Neighbourhood C then experienced a slight increase in the 4th Quarter to \$4.97. However, despite the 4th Quarter's increase, it never regained to go over \$5. It was forecasted that C would be the first neighbourhood to be non-viable. This is what did happen.

7.2 DETAILED DATA OF QUARTERLY PARTICIPATION RATES

The individual households' participation for each neighbourhood by quarter is detailed below. The results shown measured the combination of individual household participation and neighbourhood participation week by week over the 8 quarters. These data were grouped to show the frequency by percentage of the participation rates. There were four groupings of data:

- (1) Percent of households participating every week of the quarter;
- (2) Percent of households participating at least half of the weeks in the quarter;

(3) Percent of households participating at least twice during the quarter;

(4) Percent of households participating at least once during the quarter.

The targets were arbitrary cut off points, which were used to make the data more easily read. They were not pre-set but arrived at as the data were being manipulated.

(1) 10% of the households participating at least half of the weeks in each quarter.

(2) 20% of the households participating at least twice during the quarter.

(3) 40% of the households participating at least once during the quarter.

The targets could be useful for other recycling projects in considering different strategies. For the Glenorchy Project, there were three options available in the event that the targets were not being met. First, the publicity campaign could be stepped up, but this option would have involved extra time and money. Second, the frequency of collection could have been reduced, but this second option may have further eroded the participation rates because of the uncertainty and potential confusion over days of collection. Third, the collection of recyclables in a particular neighbourhood could be phased out.

At the end of section 7.2, the target results and the consequences for each neighbourhood are discussed. The overall participation data enabled the author to see if the concept of gradually increasing participation rates by the "spreading-the-word-by-example" model was effective.

1st Quarter Data

Overall, the households participating at 'least once' during the quarter made up 41.2% which was above the target of 40%. Neighbourhood A had a coverage of 49.8%, or almost one in every second household. Neighbourhood B almost reached the target of 40% with 39.4% of the households participating 'at least once' during the quarter. Neighbourhood C achieved 35% for the 'at least once' category. (See Table 7-2-1)

In all neighbourhoods, the percent of households participating 'at least twice' in the 1st Quarter exceeded 20%. The third set of data of households who participated 'at least half' of the weeks failed to see any of the neighbourhoods meet the 10% target. The fourth set of data showing the percent of households participating 'every week' was almost nil in all neighbourhoods.

The 1st Quarter revealed that there was a wide level of participation, but only a moderate intensity of participation.

TABLE 7-2-1 1ST QUARTER - PERCENTAGE OF HOUSEHOLDS PARTICIPATION BY WEEK - NEIGHBOURHOODS A, B, AND C.

	PERCENT OF HOUSEHOLDS PARTICIPATING EVERY WEEK OF 1ST QUARTER	PERCENT OF HOUSEHOLDS PARTICIPATING HALF OF THE WEEKS OF 1ST QUARTER	PERCENT OF HOUSEHOLDS PARTICIPATING AT LEAST TWICE DURING 1ST QUARTER	PERCENT OF HOUSEHOLDS PARTICIPATING AT LEAST ONCE DURING 1ST QUARTER
<u>NEIGHBOURHOOD</u>				
A	0.5%	7.3%	31.6%	49.8%
B	----	5.6%	28.8%	39.4%
C	----	4.3%	21.2%	35.0%
TOTAL	0.001	5.8%	27.4%	41.2%

2nd Quarter Data

Overall, the percent of households participating 'at least once' fell from 41.2% in the 1st Quarter to 28.2% in the 2nd. All neighbourhoods dropped significantly, but only Neighbourhood A approached the target of 40% with a 39.6%. Neighbourhood B and C could only manage 22.9% and 22.1%, respectively.

The second category of 'at least twice' revealed that Neighbourhood A was the only one to exceed the target of 20% with a 27.6% rate.

The third category of households participating 'at least half' showed that only in Neighbourhood A was the 10% target reached. (See Table 7-2-2)

It is clear that both the intensity and the distribution of participation slipped in Neighbourhood B and C. This partly was due to the smaller households in Neighbourhood B as well as the erosion of enthusiasm after the 1st Quarter.

TABLE 7-2-2 2ND QUARTER - PERCENTAGE OF HOUSEHOLDS'
PARTICIPATION BY WEEK - NEIGHBOURHOODS A, B, AND C.

PERCENT OF HOUSEHOLDS PARTICIPATING EVERY WEEK OF 2ND QUARTER	PERCENT OF HOUSEHOLDS PARTICIPATING HALF OF THE WEEKS IN THE 2ND QUARTER	PERCENT OF HOUSEHOLDS PARTICIPATING AT LEAST TWICE IN THE 2ND QUARTER	PER CENT OF HOUSEHOLDS PARTICIPATING AT LEAST ONCE DURING THE 2ND QUARTER
<u>NEIGHBOURHOOD</u>			
A 0.0%	13.5%	27.6%	39.6%
B 0.0%	0.3%	7.0%	22.9%
C 1.6%	4.3%	13.0%	21.1%
<u>TOTALS</u>			
0.5%	5.9%	15.7%	28.2%

3rd Quarter Data

The 3rd Quarter saw a resurgence of participation in the 'at least once' category with a total of 43.5%. Neighbourhood A had a strong showing with 60.4% which exceeded the 40% target easily. Neighbourhood B approached the target with 38.4. Neighbourhood C increased their percentage from 22.1% in the 2nd Quarter to 30.9%. The strong increase in the 'at least once' category indicated that residents were participating in the Project and that viability potential in all three neighbourhoods was improving.

The second category, those households who participated 'at least twice,' also showed a marked improvement over the 2nd Quarter. Only Neighbourhood A exceeded the 20% target, but Neighbourhood B came close with 17.2%. The overall total of 21.9% revealed that there was a significant increase of committed participants. (See Table 7-2-3)

The category of participation of 'at least half' of the weeks was encouraging in Neighbourhood A with 12%, but not encouraging in Neighbourhoods B or C. The overall total of 6.5% showed that the target of 10% was still elusive. The 6.5% total was an increase from the 2nd Quarter figure of 5.9% for the total of 'at least half' category.

TABLE 7-2-3 3RD QUARTER - PERCENTAGE OF HOUSEHOLDS'
PARTICIPATION BY WEEK - NEIGHBOURHOODS A, B, AND C

PERCENT OF HOUSEHOLDS PARTICIPATING EVERY WEEK DURING 3RD QUARTER	PERCENT OF HOUSEHOLDS PARTICIPATING HALF OF THE WEEKS OF THE 3RD QUARTER	PERCENT OF HOUSEHOLDS PARTICIPATING AT LEAST TWICE DURING 3RD QUARTER	PERCENT OF HOUSEHOLDS PARTICIPATING AT LEAST ONCE DURING 3RD QUARTER
<u>NEIGHBOURHOOD</u>			
A 0.5%	12.0%	33.8%	60.4%
B 0.3%	4.0%	17.2%	38.4%
C 0.4%	3.6%	14.6%	30.9%
<u>TOTALS</u>			
0.2%	6.5%	21.9%	43.5%

4th Quarter Data

After one year of the Project, an overall figure of 60.1% for households participating 'at least once' was achieved. (See Table 7-2-4) This marked a highlight of the Project.

In the 4th Quarter, Neighbourhood A again exceeded the 40% target easily with 59% of 'at least once'. Neighbourhood B also exceeded the target, with a solid 49.7%. It was in Neighbourhood C that a strange anomaly took place. Neighbourhood C achieved a 74.2%. One could only speculate that the word had spread and that the summer (spring) clean out was the reason for the high percentage in Neighbourhood C. It did reveal that the one time participants didn't necessarily participate twice in the quarter. The 74.2% dropped off sharply to only 21.3% for households participating 'at least twice.' It meant that over 50% of the participating households in Neighbourhood C did not participate again during the 4th Quarter.

In Neighbourhood A, 36.7% participated at 'least twice' during the 4th Quarter. This meant that the householders were more committed to the programme than the householders in Neighbourhood C. Neighbourhood B achieved the target of 20.5%, but was down compared to Neighbourhood A's 36.7%. (See Table 7-2-4)

The third category of 'at least half' of the weeks failed to achieve the 10% overall as the rate fell back to 5.2%. The figure of around 5% had been the pattern for the first four quarters. The needed frequency of householders' participation was not very high.

The 4th Quarter showed that Neighbourhood C recorded an unusually high rate for household participation of 'at least once.' However, despite this high figure for Neighbourhood C, the difference between 'at least once' and 'at least twice' was very high in Neighbourhood C; lower in Neighbourhood B; and the smallest in Neighbourhood A. This margin between 'at least once' and 'at least twice' gives a good indicator of how committed people were to the recycling project. This ratio (difference) was the key to a neighbourhood's overall commitment. At this stage, just based on participation, one could not forecast the drop of Neighbourhood C from the collection run except by way of this 'difference' between 'at least once' and 'at least twice' categories.

TABLE 7-2-4 : 4TH QUARTER PERCENTAGE OF HOUSEHOLDS' PARTICIPATION BY WEEK - NEIGHBOURHOODS A, B, AND C

PERCENT OF HOUSEHOLDS PARTICIPATING EVERY WEEK OF 4TH QUARTER	PERCENT OF HOUSEHOLDS PARTICIPATING HALF OF THE WEEKS OF THE 4TH QUARTER	PERCENT OF HOUSEHOLDS PARTICIPATING AT LEAST TWICE DURING 4TH QUARTER	PERCENT OF HOUSEHOLDS PARTICIPATING AT LEAST ONCE DURING 4TH QUARTER
<u>NEIGHBOURHOOD</u>			
A 0.0%	6.5%	36.7%	59.3%
B 0.3%	4.0%	20.5%	49.7%
C 0.0%	6.5%	21.3%	74.2%
<u>TOTALS</u>			
0.1%	5.2%	26.1%	60.1%

5th Quarter Data

In the 5th Quarter, the programme seemed to be achieving the assumed targets of participation, at least in the categories of participation 'once' and 'twice.' These data would generally be cause for the continued optimism of the Project. The message had gotten out to at least 40% of the households. (See Table 7-2-5) The disappointing part of the data was the relatively low percent of households who were participating 'at least half' of the weeks. Part of the rationale of weekly collection was the

opportunity for householders to develop a pattern of participation. Very few in any neighbourhood did this.

TABLE 7-2-5 5TH QUARTER PERCENTAGE OF HOUSEHOLDS' PARTICIPATION BY WEEK - NEIGHBOURHOODS A, B, AND C

PERCENT OF HOUSEHOLDS PARTICIPATING EVERY WEEK OF THE 5TH QUARTER	PERCENT OF HOUSEHOLDS PARTICIPATING HALF OF THE WEEKS OF THE 5TH QUARTER	PERCENT OF HOUSEHOLDS PARTICIPATING AT LEAST TWICE DURING THE 5TH QUARTER	PERCENT OF HOUSEHOLDS PARTICIPATING AT LEAST ONCE DURING 5TH QUARTER
<u>NEIGHBOURHOOD</u>			
A 0.0%	6.2%	22.2%	50.5%
B 0.7%	4.0%	14.6%	39.1%
C 0.0%	3.5%	16.9%	41.8%
TOTALS			
0.2%	4.5%	17.8%	43.7%

6th Quarter Data

The 6th Quarter saw the Project reduced to two neighbourhoods. This decision was reached by St. Vincent de Paul independently. St. Vincent de Paul decided to stop collection in Neighbourhood C (Claremont area) after the 5th Quarter. This decision was based less on overall participation rates than on the total amount of recyclables which were being put out for collection. The other factor inherent in this decision was the need to reduce travel costs. Claremont area was farthest from the St. Vincent de Paul's depot and brought in fewer recyclables than the other two neighbourhoods.

In the 6th Quarter, Neighbourhood A dropped off somewhat from its previous quarters, but maintained sufficient overall participation to justify the continuation of the collection scheme. Neighbourhood B's rates were well below A's and the targets for the 6th Quarter. (See Table 7-2-6)

TABLE 7-2-6 6TH QUARTER PERCENTAGE OF HOUSEHOLDS'
PARTICIPATION BY WEEK - NEIGHBOURHOODS A AND B.

PERCENT OF HOUSEHOLDS PARTICIPATING EVERY WEEK OF 6TH QUARTER	PERCENT OF HOUSEHOLDS PARTICIPATING AT LEAST HALF OF THE WEEKS OF 6TH QUARTER	PERCENT OF HOUSEHOLDS PARTICIPATING AT LEAST TWICE DURING THE 6TH QUARTER	PERCENT OF HOUSEHOLDS PARTICIPATING AT LEAST ONCE DURING THE 6TH QUARTER	
<u>NEIGHBOURHOOD</u>				
A	0.0%	7.6%	25.0%	44.4%
B	0.0%	5.0%	14.6%	22.5%
C	(NO COLLECTION)			
<hr/>				
TOTALS	0.0%	6.2%	19.6%	37.7%

7th Quarter Data

The 7th Quarter shows only data for Neighbourhood A. The decision to stop collection in Neighbourhood B was made because of five main reasons:

- (1) drop in participation rates;
- (2) change in management at St. Vincent de Paul's;
- (3) drop in value of collected recyclables;
- (4) drop in price for recyclables sold to purchasers; and
- (5) limited space at St. Vincent de Paul's shop site.

Neighbourhood A continued to achieve the targets set out at the beginning of this section. There was an important increase in the category of households participating 'at least half' of the weeks to 11.6%. (See Table 7-2-7) This rate reflected the growing and sustained commitment to the Project by the residents of Neighbourhood A which emerged as the only viable neighbourhood.

TABLE 7-2-7 7TH QUARTER PERCENTAGES OF HOUSEHOLDS'
PARTICIPATION BY WEEK - NEIGHBOURHOOD A

PERCENT OF HOUSEHOLDS PARTICIPATING EVERY WEEK OF THE 7TH QUARTER	PERCENT OF HOUSEHOLDS PARTICIPATING AT LEAST HALF OF THE WEEKS OF 7TH QUARTER	PERCENT OF HOUSEHOLDS PARTICIPATING AT LEAST TWICE DURING 7TH QUARTER	PERCENT OF HOUSEHOLDS PARTICIPATING AT LEAST ONCE DURING THE 7TH QUARTER
--	--	--	---

NEIGHBOURHOOD

A	0.7%	11.6%	25.8%	41.5%
---	------	-------	-------	-------

B	(NO COLLECTION)			
---	-----------------	--	--	--

C	(NO COLLECTION)			
---	-----------------	--	--	--

TOTALS	0.7%	11.6%	25.8%	41.5%
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8th Quarter Data

In the final Quarter, Neighbourhood A was the only neighbourhood with data due to the decision by St. Vincent de Paul to discontinue collection in Neighbourhoods B and C. Neighbourhood A showed a consistency of around 40% for 'at least once'; 20% for 'at least twice' and near 10% for 'at least half' the weeks. (See Table 7-2-8) These data indicated the depth and breadth of commitment and involvement for Neighbourhood A in the Recycling Project.

TABLE 7-2-8 8TH QUARTER PERCENTAGES OF HOUSEHOLDS'
PARTICIPATION BY WEEK - NEIGHBOURHOOD A.

PERCENT OF HOUSEHOLDS PARTICIPATING EVERY WEEK OF THE 8TH QUARTER	PERCENT OF HOUSEHOLDS PARTICIPATING AT LEAST HALF OF THE WEEKS OF THE 8TH QUARTER	PERCENT OF HOUSEHOLDS PARTICIPATING AT LEAST TWICE DURING 8TH QUARTER	PERCENT OF HOUSEHOLDS PARTICIPATING AT LEAST ONCE DURING THE 8TH QUARTER
--	---	--	---

NEIGHBOURHOOD

A	0.7%	9.8%	27.6%	43.3%
---	------	------	-------	-------

B	(NO COLLECTION)			
---	-----------------	--	--	--

C	(NO COLLECTION)			
---	-----------------	--	--	--

TOTALS

0.7%	9.8%	27.6%	43.3%
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TABLE 7-2-9 ACHIEVED TARGET RATES FOR PARTICIPATION
OVER 8 QUARTERS

TARGET OF 1% HOUSEHOLDS PARTICIPATING EVERY WEEK OF QUARTER	TARGET OF 10% HOUSEHOLDS PARTICIPATING AT LEAST HALF OF THE WEEKS OF EACH QUARTER	TARGET OF 20% HOUSEHOLDS PARTICIPATING AT LEAST TWICE DURING EACH QUARTER	TARGET OF 40% HOUSEHOLDS PARTICIPATING AT LEAST ONCE EACH QUARTER
---	--	--	---

ACTUAL/POTENTIAL	ACTUAL/POTENTIAL	ACTUAL/POTENTIAL	ACT/POT
NEIGHBOURHOOD			

A	0	8	4	8	8	8	7	8
B	0	6	0	6	2	6	3	6
C	1	5	0	5	2	5	2	5
T	1	19	4	19	12	19	12	19

DISCUSSION OF RESULTS (7.2) - QUARTERLY PARTICIPATION RATES

Neighbourhood A

Neighbourhood A reached a total of 7 out of 8 quarters where at least 40% of the households participated at 'least twice' each quarter. This showed a good coverage of participants in A.

Participation in at 'least half' of the weeks of each quarter showed that in 4 out of 8 quarters, Neighbourhood A was able to achieve at least 10% of the households participating. This category was an essential mark because it showed the depth of dedication of households to the Project. This meant that during the quarters, a nucleus of householders was participating. In the 2nd Quarter, 13.5% wasn't a particularly high score, but it was never matched again. This showed the limited commitment on the part of about 90% of the households.

Less than 1% of the households participated 'every week'. These data strongly suggest that while there was some regularity and repetition for household participation, it was not in evidence throughout the Project. Even in A, there were no quarters in which the number of households participating 'every week' totaled more than 1%.

Neighbourhood B

Neighbourhood B achieved only 3 out of 6 quarters in the 40% participation category .

The second group of at 'least 20%' of the households participating at 'least twice' during the quarter showed B reaching it 2 out of 6 quarters. This showed that B did not have a wide household participation commitment.

Neighbourhood B didn't have any quarters which achieved the 10% category of participation of at 'least half' of the weeks, further showing the tenuous basis for B's viability.

Neighbourhood C

Only Neighbourhood C scored one quarter where there was more than 1% participation 'every week' of the quarter. The 4th Quarter was an aberration for C with 74.2% participating 'at least once.' This indicated how successful the Project was in reaching almost 3/4th of the households. Unfortunately, the 74.2% represents only those who participated once. The category of 'at least twice' showed that C reached 20%+ twice. This represents a low percentage of participation and not much depth to the participation.

Overall

The data suggested that there was a burst of enthusiasm and participation following the questionnaire survey and the follow-up brochure, but the enthusiasm waned.

The percentage of households participating 'every week' continued to be less than 1% overall. This suggested that few households were regular enough in their recycling habits to participate every week. It is also possible that if the collections were not carried out every week, the rate for 'at least half' of the weeks may have dropped significantly because of the uncertainty in the mind of the householder of when the next collection day would be.

About 4 out of every 10 houses in all neighbourhoods participated at 'least once' during the Project. The 40% participation rate was not high enough to maintain the viability of the Project in 2 out of the 3 neighbourhoods.

Neighbourhood A was the only neighbourhood which met the participation rates' minimum figures for a viable project.

One of the objectives of the Project was to reach as many households as possible over the life of the Project. The 4th Quarter was the best quarter for achieving the breadth of participation with an overall percent of 60.1%. The last two

quarters, which only Neighbourhood A participated, started to reflect a stronger commitment with 11.6% and 9.8% participation rate of households participating 'at least half' of the weeks of the quarter.

Despite the other variables such as distance from depot, management of the project, publicity, and quantity of recyclables, it was clear that without a high percentage of participation, the on-going success of the Project was in question.

Table 7-2-9 shows that only Neighbourhood A came close to the targets in most quarters. The strongest indicator of the lack of commitment in both Neighbourhood B or C was the fact that in no quarter was the 10% target achieved in the 'at least half' of the weeks category. This contrasted with the Neighbourhood A's 50% of the quarters where the 10% target was reached.

7.3 INTENDED VERSUS ACTUAL PARTICIPATION RATES OF CONTACTED HOUSEHOLDS

The contacted households were broken into 6 groupings. These groupings were made to see if the data indicated patterns in participation. Also, comparisons were made between the 6 groupings listed below:

- (1) those householders who said (YES) when asked to answer the questionnaire and who said they would participate in the Recycling Project, (YES/YES);
- (2) those householders who answered the questionnaire (YES), but said they would not participate in the Recycling Project, (YES/NO);
- (3) those householders who answered the questionnaire (YES), but said that they may or may not participate in the Recycling Project, (YES/MAYBE);
- (4) those householders who would not answer the questionnaire (NO), but said that they may participate in the Recycling Project, (NO/MAYBE);
- (5) those householders who said they would not answer the questionnaire (NO), but would participate in the Recycling Project, (NO/YES); and
- (6) those householders who said they would not answer the questionnaire, and would not participate in the Recycling Project, (NO/NO).

The six groupings above and the participation rates of each are described by quarter and by neighbourhood.

Three concepts, 4, 5, & 6 of the 11 overall concepts of the Study, are discussed at the end of the section and are below:

Concept 4) - that those householders that responded yes initially to participating, would be the highest and most consistent participants;

Concept 5) - that those householders who answered no or maybe would start participating once the Project started and they saw the positive side of the Project;

Concept 6) - that the difference between what people said they would do and what they actually did in practice during the life of the Project would be significant.

1st Quarter Data

Neighbourhood A's households that answered the questionnaire and who said they would participate had the highest percentage with 22.9% actually participating in the 1st Quarter. The second positive grouping, (NO/YES), or those householders who did not answer the questionnaire, but did say they would participate in the recycling project, was only slightly less than the (YES/YES) grouping with 21.7% participating. (See Table 7-3-1)

The (YES/MAYBE) grouping scored 11.5%. This percentage showed this grouping's ambivalence and limited participation in the programme.

The negative third of the contacted households was low in actual participation. Those who answered the questionnaire but said they would not participate (YES/NO) made up 5.3% and the (NO/NO) grouping made up a low, 2.3%. However, one can say that these last two percentages represent the households of the two negative groupings that were 'converted' to the Recycling Project during the 1st Quarter.

The 18% total figure of contacted households in Neighbourhood A is a composite figure of all contacted households or the potential participation versus the actual participation during the 1st Quarter. The 18% for Neighbourhood A's total represents 237 households who actually did participate during the 1st Quarter.

TABLE 7-3-1

PERCENTAGES OF PARTICIPATION OF CONTACTED HOUSEHOLDS -
GLENORCHY, TASMANIA

1ST QUARTER

		<u>NEIGHBOURHOOD A</u>	<u>NEIGHBOURHOOD B</u>	<u>NEIGHBOURHOOD C</u>
Answered Question- naire	Response to Participate			
yes/	yes	22.9%	15.0%	22.1%
no/	yes	21.7%	31.7%	2.8%
yes/	maybe	11.5%	8.3%	5.0%
no/	maybe	-----	-----	-----
yes/	no	5.3%	8.7%	3.5%
no/	no	2.3%	7.8%	1.7%
Total		18.0%	11.9%	14.9%

The 1st Quarter for Neighbourhood B saw 15% of households actually participating in the (YES/YES) grouping. This was made up for with the 31.7% of the (NO/YES) grouping. The most interesting figures were the relatively high percentage of those households who said they would not participate, but over the course of the 1st Quarter did actually participate.

The total of 11.9% of households in all the contacted groupings for Neighbourhood B was relatively low. It meant that the 'contacted' groupings would be challenged by the non-contacted groups for the lead in participation.

In Neighbourhood C, the (YES/YES) grouping scored a 22.1%, which was well above all other groupings for actual participation. The (YES/MAYBE) grouping had 5.0%, while the (NO/YES) had a disappointing 2.8%. The (YES/NO) had 3.5% and the (NO/NO) scored a mere 1.7%.

2nd Quarter Data

In Neighbourhood A, the figures dropped for the top three categories of positive responses, but not sharply. There was a gain in the negative groupings which helped offset the loss in the positive groupings. The 15.9% total was down from 18% in the 1st Quarter. (See Table 7-3-2)

In Neighbourhood B, all groups were considerably down from the 1st Quarter. The 3% total figure suggested that the participation rates in B were in danger of not being sufficient to continue the collection of recyclables.

In Neighbourhood C during the 2nd Quarter, there were gains in two categories, most significantly in the (YES/NO) group. This meant that some of the initial negative response to participation was being modified. The total of all contacted households was 10.9%, a drop from the 1st Quarter's figure of 14.9%. Neighbourhood C at this point was just holding on. (NOTE: These data represented an abbreviated quarter of only 8 weeks).

TABLE 7-3-2

PERCENTAGES OF PARTICIPATION OF CONTACTED HOUSEHOLDS IN
GLENORCHY, TASMANIA

2ND QUARTER

ANSWERED QUESTION- NAIRE	RESPONSE TO PARTICIPATE	NEIGHBOURHOOD A	NEIGHBOURHOOD B	NEIGHBOURHOOD C
YES/	YES	19.7%	2.7%	16.2%
NO/	YES	17.8%	2.8%	4.2%
YES/	MAYBE	12.5%	3.6%	3.0%
NO/	MAYBE	-----	-----	-----
YES/	NO	7.1%	3.4%	4.2%
NO/	NO	4.0%	4.2%	-----
Totals		15.9%	3.0%	10.9%

During the 2nd Quarter, there was a falling off of participation rates for all groupings and in all three neighbourhoods. Several factors helped explain this drop. The first factor was that people were still preoccupied with vacations and the start of school. Also the 1st Quarter had had the 'clean-out-the-garage' incentive working.

The 2nd Quarter supported the concept that a gain in actual participation would occur in the (MAYBE) and (NO) groups as the Recycling Project established itself. This did occur, but on a modest level.

3rd Quarter Data

In Neighbourhood A, there was a slight drop in the positive groupings' participation. The negative groupings held steady, but the overall total of contacted households participating was down from 15.9% to 13.8%. (See Table 7-3-3)

Neighbourhood B's data showed that there was an improvement in the positive and negative groups for an overall improvement to 7.3% total. The turn around from the 2nd Quarter enabled Neighbourhood B to continue to be a test neighbourhood.

TABLE 7-3-3

PERCENTAGES OF PARTICIPATION OF CONTACTED HOUSEHOLDS - GLENORCHY, TASMANIA

3RD QUARTER

		NEIGHBOURHOOD A	NEIGHBOURHOOD B	NEIGHBOURHOOD C
ANSWERED QUESTION- NAIRE	RESPONSE TO PARTICIPATE			
YES/	YES	16.6%	6.8%	11.4%
NO/	YES	16.4%	10.2%	16.6%
YES/	MAYBE	12.5%	2.4%	3.5%
NO/	MAYBE	-----	41.7%	-----
YES	NO	5.0%	7.2%	2.1%
NO/	NO	6.6%	7.8%	2.5%
TOTALS		13.8%	7.3%	8.3%

Neighbourhood C posted results in the positive groupings of 11.4% and 16.6%. The negative groupings were up from the 2nd Quarter in Neighbourhood A and B, but down in C. The overall total percentage of 8.3% of contacted households in Neighbourhood C fell from 10.9% in the 2nd Quarter. This was one more sign that the case for continuing the Project in Neighbourhood C was growing weaker.

4th Quarter Data

In Neighbourhood A, the positive groupings held steady with some overall loss from the 3rd Quarter. The negative groups gained slightly to reverse the overall slide and to reflect the growing participation rates even amongst essentially negative householders. The overall total was down from 13.8% in the 3rd Quarter to 12.7% in the 4th Quarter. (See Table 7-4-4) Neighbourhood A managed to stay above the 10% mark for the total percentage of contacted households.

In Neighbourhood B, the positive groups held steady, while the (MAYBE) groupings improved by almost 8%. This 8% only represented a relatively small amount of the total number. Hence, it did not have the impact on the total percentage that an increase would have had in the positive groupings.

TABLE 7-3-4

PERCENTAGES OF PARTICIPATION OF CONTACTED HOUSEHOLDS IN GLENORCHY, TASMANIA

4TH QUARTER

		NEIGHBOURHOOD A	NEIGHBOURHOOD B	NEIGHBOURHOOD C
ANSWER QUESTION- NAIRE	RESPONSE TO PARTICIPATE			
YES/	YES	14.9%	5.7%	9.8%
NO/	YES	14.2%	10.2%	5.5%
YES/	MAYBE	10.4%	10.7%	5.3%
NO/	MAYBE	-----	41.7%	-----
YES/	NO	6.8%	5.7%	4.2%
NO/	NO	6.8%	8.3%	13.3%
TOTALS		12.7%	6.9%	8.3%

Neighbourhood C's totals for the positive groupings were down from the 3rd Quarter figures. However, a significant jump from the negative groupings enabled Neighbourhood C to maintain an 8.3% overall. This was below the 10% target.

5th Quarter Data

In Neighbourhood A, the continued slide occurred in the positive groupings. In the negative groupings, there was a reasonable improvement from 6.8% to 9.1% in the (YES/NO) grouping. This small improvement enabled Neighbourhood A to just remain above 10% for the total. (See Table 7-3-5)

Neighbourhood B's data showed a similar pattern to the 4th Quarter data. The overall total was a slight improvement from 6.9% to 7.1% in the 5th Quarter. Again, these data showed that the contacted sector was not participating sufficiently to maintain viability for the programme.

TABLE 7-3-5

PERCENTAGES OF PARTICIPATION OF CONTACTED HOUSEHOLDS - GLENORCHY, TASMANIA

5th Quarter

	NEIGHBOURHOOD A	NEIGHBOURHOOD B	NEIGHBOURHOOD C	
ANSWER QUESTION- NAIRE	RESPONSE TO PARTICIPATING			
YES/	YES	11.7%	5.0%	9.2%
NO/	YES	9.2%	12.0%	5.5%
YES/	MAYBE	7.3%	10.7%	4.6%
NO/	MAYBE	----	41.7%	----
YES/	NO	9.1%	7.6%	3.4%
NO/	NO	6.1%	7.2%	16.6%
TOTALS		10.2%	7.1%	7.8%

In Neighbourhood C, the percentages held constant from the 4th Quarter data. The big surprise was the continued large percentage of the (NO/NO) grouping with 16.6%. This large percentage was the reason that the total was able to reach 7.8% for the whole quarter. The conversion factor was 16.6%, thus supporting the concept that once the Project was operating there would be a sizeable gain in the MAYBE and NO groupings. However, this was the last quarter for Neighbourhood C, as C consistently could not reach the 10% cut-off figure.

6th Quarter Data

Neighbourhood A entered the 6th Quarter with a steady decline overall. The decline continued and for the first time, Neighbourhood A slipped below 10% to 9.1% overall. (See Table 7-3-6) All but the (MAYBE) grouping declined slightly. It is noteworthy that the negative groupings did not gain as the concept purported, but slipped further, with the (NO/NO) grouping down to 1.5%.

TABLE 7-3-6

PERCENTAGES OF PARTICIPATION OF CONTACTED HOUSEHOLDS - GLENORCHY, TASMANIA

6th Quarter

		<u>NEIGHBOURHOOD A NEIGHBOURHOOD B NEIGHBOURHOOD C</u>		
ANSWER QUESTION- NAIRE	RESPONSE TO PARTICIPATING			
YES/	YES	11.4%	3.3%	(NO COLLECTION)
NO/	YES	4.2%	7.4%	
YES/	MAYBE	10.4%	14.3%	
NO/	MAYBE	-----	16.7%	
YES/	NO	6.8%	5.3%	
NO/	NO	1.5%	4.4%	
TOTALS		9.1%	4.8%	

In Neighbourhood B, the 6th Quarter recorded a very low 3.3% in the (YES/YES) grouping and a 7.4% in (NO/YES) grouping. There was a significant increase in the (YES/MAYBE) and (NO/MAYBE) groupings with 14.3% and 16.7%, respectively. The (YES/NO) had 5.3% and 4.4% in the (NO/NO). Overall, a low 4.8% for contacted households emerged. There was a strong (YES/MAYBE) and (NO/MAYBE) showing. These obvious peak percentages supported the concept that the MAYBE and NO groupings would show an improvement in the percentage rate. The concept that the positive householders would have the highest percentages of participation wasn't born out by the data in Neighbourhood B.

Neighbourhood C did not have figures for the 6th Quarter because collection had ceased.

7th Quarter Data

In the 7th Quarter, Neighbourhood A increased its overall participation rating to 11.6%. The (YES/YES) grouping increased to 13.5%, the highest category. (See Table 7-3-7) The (NO/YES) also had a good showing with 11.6%, as did the (YES/MAYBE) grouping with 11.5%. Both of these figures supported the concept that the maybe and negative groupings could be won over to participation in the Project. The (YES/NO) and (NO/NO) had a reasonable percentage with 6.8% and 5.3%, respectively. This supported the concept that people do things differently from what they say they will do when answering questionnaires.

TABLE 7-3-7

PERCENTAGE OF PARTICIPATION OF CONTACTED HOUSEHOLDS - GLENORCHY, TASMANIA

7TH QUARTER

		NEIGHBOURHOOD A	NEIGHBOURHOOD B	NEIGHBOURHOOD C
ANSWER QUESTION- NAIRE	RESPONSE TO PARTICIPATING			
YES/	YES	13.5%	(NO COLLECTION)	(NO COLLECTION)
NO/	YES	11.6%		
YES/	MAYBE	11.5%		
NO/	MAYBE	-----		
YES/	NO	6.8%		
NO/	NO	5.3%		
TOTAL		11.6%		

8th Quarter Data

The 8th Quarter, the last full quarter for Neighbourhood A, saw a slight increase in the (YES/YES) to 13.5% while (NO/YES) registered 11.7%. The big increase for the second quarter in a row was (YES/MAYBE) with 19.8%. The (YES/NO) grouping's 2.3% and the (NO/NO) grouping's 6.1% remained about the same with a slight drop in these negative groupings. Overall, the 11.8% participation rates remained about the same for contacted households. The concept was confirmed in that the 'MAYBE' groupings did reach new participation rate heights while the 'NO' groupings remained more static. The 'YES' groupings were the

leaders overall, but the growth rate was not as marked as in the 'MAYBE' groupings.

The recovery was confirmed, with two quarters running with totals over 10%. The last remaining neighbourhood to be operating, Neighbourhood A, established that only the higher income areas have a chance for viability in recycling projects.

TABLE 7-3-8

PERCENTAGES OF PARTICIPATION OF CONTACTED HOUSEHOLDS -
GLENORCHY, TASMANIA

8TH QUARTER

	<u>NEIGHBOURHOOD A NEIGHBOURHOOD B NEIGHBOURHOOD C</u>	
ANSWER QUESTION- NAIRE	RESPONSE TO PARTICIPATING	
YES/	YES	13.5% (NO COLLECTION) (NO COLLECTION)
NO/	YES	11.7%
YES/	MAYBE	19.8%
NO/	MAYBE	-----
YES/	NO	2.3%
NO/	NO	6.1%
TOTAL		11.8%

DISCUSSION OF RESULTS (7.3) - CONTACTED HOUSEHOLDS

The idea that one could measure what householders said they would do (their response to the question 16 of the questionnaire survey) against what they actually did (their participation rates) was an important component of the Study. Despite the propensity not to do what they said they would, the contacted households scored higher than the non-contacted group in Neighbourhood C for the first 2 quarters. The non-contacted group overtook the contacted group by the 3rd Quarter which confirmed the concept of spreading-the-word-by-example model.

The 6 categories of contacted households over the 8 quarters served as a basis for measuring the differences between the categorized households. The 6 groups of contacted households allowed for the graduation of feeling towards the questionnaire

survey. That response was measured against what households actually did with their recyclables once the Recycling Project was up and running.

The data measured against the assumptions established the following:

In all neighbourhoods, the highest percentages of participation with only a few exceptions were in the (YES/YES) and (NO/YES), the positive groupings. These positive groupings did participate most consistently overall. The exception was the MAYBE grouping. Towards the end of the testing period, the MAYBE grouping's high percentage was due in part to the small absolute numbers in this group and because the tentative answer was turned into a positive action response.

As the Project continued, there was a marked increase in participation of NO and MAYBE groupings. In the 4th Quarter, Neighbourhood C had 13.3% from the (NO/NO) grouping with an increase in the 5th Quarter to 16.6%. This was the realization of the concept that the NO and MAYBE groupings would increase once the Project was up and established. In both Neighbourhoods A and B, most of the increases occurred in the MAYBE group. For example, from the 5th Quarter to the 6th Quarter saw the (YES/MAYBE) grouping increase from 10.7% to 14.3%.

The concept that people do something differently than what they say to questionnaire surveyors was confirmed by the negative and positive groupings, as the positive groupings only achieved near 20% participation in the first week of the 1st Quarter in Neighbourhood A. Overall, for most of the quarters, the rates hovered around 10%. Even if one assumed the best, only between 12% to 15% of the householders did what they said they would do. In Neighbourhood B and C it was even less. This is a very significant finding of the Study.

The negative groupings were more honest in their initial reaction to the questionnaire survey. In Neighbourhood C during the 5th Quarter, over 16% did participate. This was the highest rate of participation in the negative grouping. This must be added to the percentage of households not doing as they said they would. Of course, it was beneficial that they did participate, but it did reinforce the fact that people say one thing on questionnaire contacts and do the opposite in practice.

The data suggest that the positive respondees to the questionnaire survey did score higher consistently in actual participation. However, the negative householders were more honest in their initial reaction to the questionnaire. For Neighbourhood A, in the First Quarter, about 22% of the YES/YES grouping did participate at least once during the quarter. (See Table 7-3-1) This meant the 78% were not doing what they said they would - participate!

In the negative grouping only 5.3% and 2.3%, respectively, did what they said they would not do. In this case, they did participate in the Project. The figures below show the percentages of households in Neighbourhood A in the First Quarter who did something different than what they said they would do.

7.4 BENEFITS OF PERSONAL CONTACTS OF HOUSEHOLDS

The households were divided into contacted (those households at which a person was home and was seen by the questionnaire surveyor), and the non-contacted households.

The following 5 concepts, 1, 8, 9, 10, & 11 of the 11 concepts were put forward:

- (1) - that there would be a higher participation rate by contacted households than by non-contacted households in each neighbourhood for the first two quarters;
- (8) - that contacted households in all neighbourhoods would produce higher rates of participation than non-contacted households
- (9) - that those households not contacted via the questionnaire survey would produce higher participation rates in Neighbourhood A than in the other 2 neighbourhoods;
- (10) - that over the life of the Project (8 quarters or 2 years), there would be an equalizing of participation rates between the contacted and non-contacted households;
- (11) - that as the Project continued, a larger percentage of non-contacted households would begin to participate because of 'word-of-mouth' communication and seeing the example of their neighbours participating;

The above 5 concepts were explored by quarter (over time) and by neighbourhood (location).

1st Quarter Data

The 1st Quarter data show that in all three neighbourhoods, the contacted households exceeded the non-contacted households by significant margins. The 18% in Neighbourhood A of contacted households was low compared to the number of householders who said they would participate in the Project while answering the questionnaire survey. (See Table 7-4-1) Overall, in all neighbourhoods the benefits of the personal contact were apparent.

TABLE 7-4-1

PERCENTAGE OF CONTACTED VERSUS NON-CONTACTED HOUSEHOLDS'
PARTICIPATION RATES - GLENORCHY, TASMANIA

1ST QUARTER

NEIGHBOURHOOD A		NEIGHBOURHOOD B	NEIGHBOURHOOD C
CONTACTED	18.0%	12.7%	14.9%
NON-CONT.	12.2%	8.6%	5.6%
TOTALS	14.1%	10.3%	10.3%

2nd Quarter Data

In the 2nd Quarter, all neighbourhoods in the contacted category exceeded the non-contacted. However, the margin in Neighbourhood B was only 1.2%. There was an overall drop in total participation rates, with only Neighbourhood A scoring in the double figures. Neighbourhood B dropped to 4.9% total which indicated a rough time ahead for Neighbourhood B. The data for the 2nd Quarter were limited overall to 9 weeks in Neighbourhood A; 8 weeks in Neighbourhood B; and 8 weeks in Neighbourhood C due to the driver leaving St. Vincent de Paul. (See Table 7-4-2)

TABLE 7-4-2

PERCENTAGES OF CONTACTED VERSUS NON CONTACTED HOUSEHOLDS'
PARTICIPATION RATES, GLENORCHY, TASMANIA

2ND QUARTER

<u>NEIGHBOURHOOD A</u>	<u>NEIGHBOURHOOD B</u>	<u>NEIGHBOURHOOD C</u>
CONTACTED 16.0%	5.6%	11.3%
NON-CONTACTED 12.0%	4.4%	4.5%
TOTALS 13.5%	4.9%	7.6%

3rd Quarter Data

The 3rd Quarter data during this winter quarter saw Neighbourhood A's contacted group (14.0%) overtaken by the non-contacted group's 15.2%. This confirmed the idea that as the Project continued, there would be a greater increase in the non-contacted category because of the word-of-mouth communication and seeing the regularity of the collection.

Neighbourhood B bounced back from the 2nd Quarter's 4.9% total to an 8.4% total. However, as in Neighbourhood A, the non-contacted group passed the contacted group by 2.1%. (See Table 7-4-3)

TABLE 7-4-3

PERCENTAGE OF CONTACTED VERSUS NON-CONTACTED HOUSEHOLDS'
PARTICIPATION RATE - GLENORCHY, TASMANIA

3RD QUARTER

<u>NEIGHBOURHOOD A</u>	<u>NEIGHBOURHOOD B</u>	<u>NEIGHBOURHOOD C</u>
CONTACTED 14.0%	7.2%	6.6%
NON-CONTACTED 15.2%	9.3%	6.3%
TOTALS 14.7%	8.4%	6.5%

In the Neighbourhood C, both categories were almost tied. However, the total was only 6.5% of the potential households which actually participated.

4th Quarter Data

In the 4th Quarter, the non-contacted category exceeded the contacted group in all three neighbourhoods. The widest margin was in Neighbourhood B. The message was obviously spreading. It also marked the first time since the 1st Quarter that the total participation rate in all neighbourhoods was over 10%. (See Table 7-4-4)

The concept that the non-contacted group would start participating after the Project was up and running was confirmed based on these data.

TABLE 7-4-4

PERCENTAGES OF CONTACTED VERSUS NON-CONTACTED HOUSEHOLDS'
PARTICIPATION RATES - GLENORCHY, TASMANIA

4TH QUARTER

<u>NEIGHBOURHOOD A</u>		<u>NEIGHBOURHOOD B</u>	<u>NEIGHBOURHOOD C</u>
CONTACTED	12.2%	6.9%	8.9%
NON-CONTACTED	13.0%	14.7%	12.0%
TOTALS	12.7%	11.5%	10.4%

5th Quarter Data

The 5th Quarter showed that in Neighbourhoods A and B there was a slight margin of the non-contacted over the contacted group. In Neighbourhood C, the contacted group just edged out the non-contacted group. However, the totals for Neighbourhood C and B slipped to under 10%. (See Table 7-4-5) This indicated that both B and C were on the verge of being non-viable.

TABLE 7-4-5

PERCENTAGES OF CONTACTED VERSUS NON CONTACTED HOUSEHOLDS'
PARTICIPATION RATES - GLENORCHY, TASMANIA

5TH QUARTER

<u>NEIGHBOURHOOD A</u>		<u>NEIGHBOURHOOD B</u>	<u>NEIGHBOURHOOD C</u>
Contacted	9.4%	7.0%	7.9%
Non-Contacted	10.4%	9.0%	7.5%
Totals	10.0%	8.2%	7.7%

6th Quarter Data

The 6th Quarter saw Neighbourhood A cling to a 10.4% total, while in Neighbourhood B, the totals had slipped to 7.4%. (See Table 7-4-6) The non-contacted groups had increased while the contacted groups had remained steady or had a slight decrease.

There were no data for Neighbourhood C as collection had been discontinued.

TABLE 7-4-6

PERCENTAGES OF CONTACTED VERSUS NON-CONTACTED HOUSEHOLDS'
PARTICIPATION RATES - GLENORCHY, TASMANIA

6TH QUARTER

<u>NEIGHBOURHOOD A</u>		<u>NEIGHBOURHOOD B</u>	<u>NEIGHBOURHOOD C</u>
CONTACTED	9.1%	4.7%	(NO COLLECTION)
NON-CONTACTED	14.2%	9.3%	
TOTALS	10.4%	7.4%	

7th Quarter Data

The 7th Quarter in Neighbourhood A resulted again in the non-contacted group scoring higher than the contacted group, with 13.7% and 11.6%, respectively. The overall rating was a slight increase to 12.9%. (See Table 7-4-7) These figures continued to confirm the concept that the non-contacted group would increase their participation rates once the Project was up and running.

There were no data collected for Neighbourhoods B and C for the 7th Quarter as St. Vincent de Paul had independently determined that both neighbourhoods were no longer viable.

TABLE 7-4-7

PERCENTAGES OF CONTACTED VERSUS NON-CONTACTED HOUSEHOLDS'
PARTICIPATION RATES - GLENORCHY, TASMANIA

7TH QUARTER

<u>NEIGHBOURHOOD A</u>		<u>NEIGHBOURHOOD B</u>	<u>NEIGHBOURHOOD C</u>
CONTACTED	11.6%	(NO COLLECTION)	(NO COLLECTION)
NON-CONTACTED	13.7%		
TOTAL	12.9%		

8th Quarter Data

In Quarter 8, the pattern continued in Neighbourhood A in that the non-contacted group scored 13.6% and contacted 11.8%, with an overall rating of 12.8%. (See Table 7-4-8) This indicated a marked success in attracting the non-contacted group. Neighbourhood A's data shows that by only contacting 50% of the households it could save publicity costs without cutting into the participation rates. The 'follow-by-example' approach saved considerable money in reaching the neighbourhood about the recycling project. The data also shows that the initial contacted group remained consistent throughout the 8 quarters, but did not show as much increase as did the non-contacted group.

TABLE 7-4-8

PERCENTAGES OF CONTACTED VERSUS NON-CONTACTED
HOUSEHOLDS' PARTICIPATION RATES - GLENORCHY, TASMANIA

8TH QUARTER

<u>NEIGHBOURHOOD A</u>		<u>NEIGHBOURHOOD B</u>	<u>NEIGHBOURHOOD C</u>
CONTACTED	11.8%	(no Data)	(no Data)
NON-CONTACTED	13.3%		
TOTAL	12.6%		

The Table 7-4-9 depicts the composite data over the 8 quarters for all three neighbourhoods.

TABLE 7-4-9

TOTAL AVERAGE PERCENTAGES OF CONTACTED VERSUS NO-CONTACTED HOUSEHOLDS PARTICIPATION RATES - GLENORCHY, TASMANIA

NEIGHBOURHOODS

	A		B		C	
	CONTACTED	NON CONT	CONTACT	NON CONTACT	CONTACT	NON CONT
1ST	18.0	12.2	12.7	8.6	14.9	5.6
2ND	16.0	12.0	5.6	4.4	11.3	4.5
3RD	14.0	15.2	7.2	9.3	6.6	6.3
4TH	12.2	13.0	6.9	14.7	8.9	12.0
5TH	9.4	10.4	7.0	9.0	7.9	7.5
6TH	9.1	14.2	4.7	9.3	----	-----
7TH	11.6	13.7	---	---	----	-----
8TH	11.8	13.3	---	---	----	-----
TOTAL AVERAGE						
	12.8	13.0	7.4	9.2	9.9	7.2

DISCUSSION OF RESULTS (7.4) - BENEFITS OF PERSONAL CONTACTS

Higher participation rates in all three neighbourhoods by contacted households over the first 2 quarters was confirmed. Overall, Neighbourhood C had the widest margin of contacted to non-contacted with 14.9% to 5.6%, followed by Neighbourhood A's 18% contacted to 12.2% non-contacted. All 3 neighbourhoods showed that the initial contacts paved the way for a good overall participation compared to the initial participation of the non-contacted groups.

The concept that as the Project continued, the non-contacted households would increase their participation because of communication between neighbours and the example of other neighbours' participation was confirmed. This was most apparent in the 3rd Quarter. Neighbourhood A's non-contacted group overtook the contacted group by 15.2% to 14.0%. Neighbourhood B's

FIGURE 7-9 PARTICIPATION RATES OF CONTACTED VERSUS NON-CONTACTED HOUSEHOLDS - NEIGHBOURHOOD A

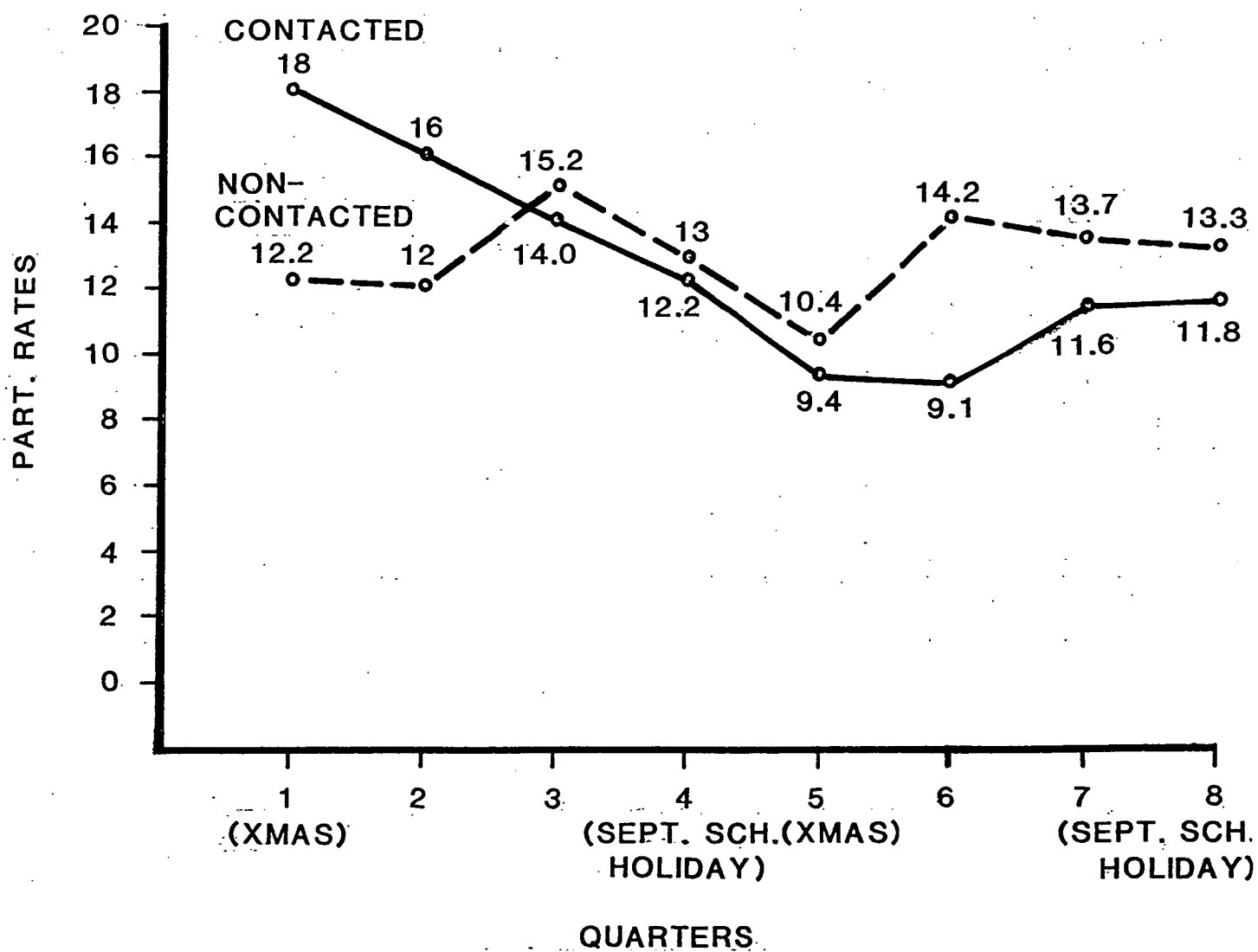
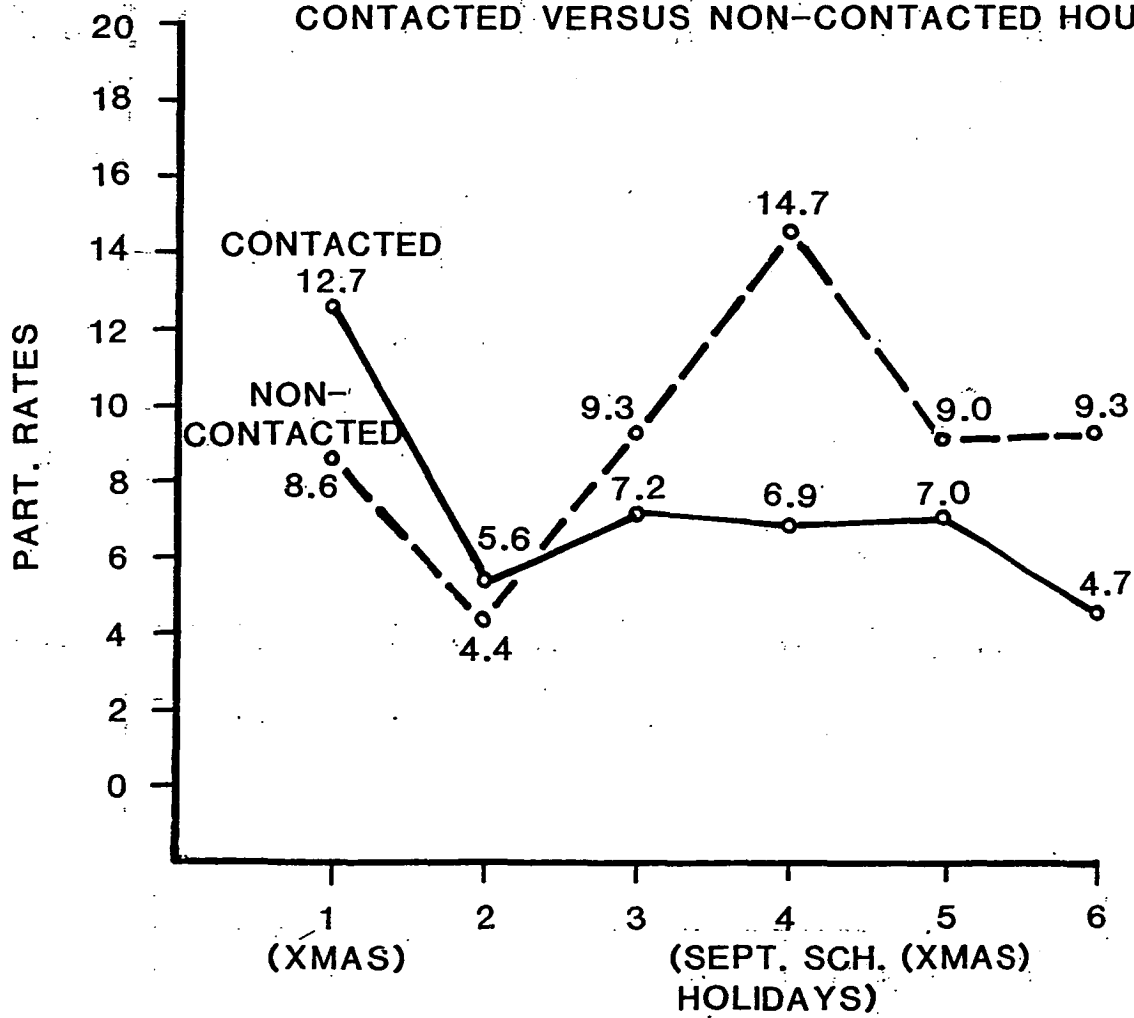
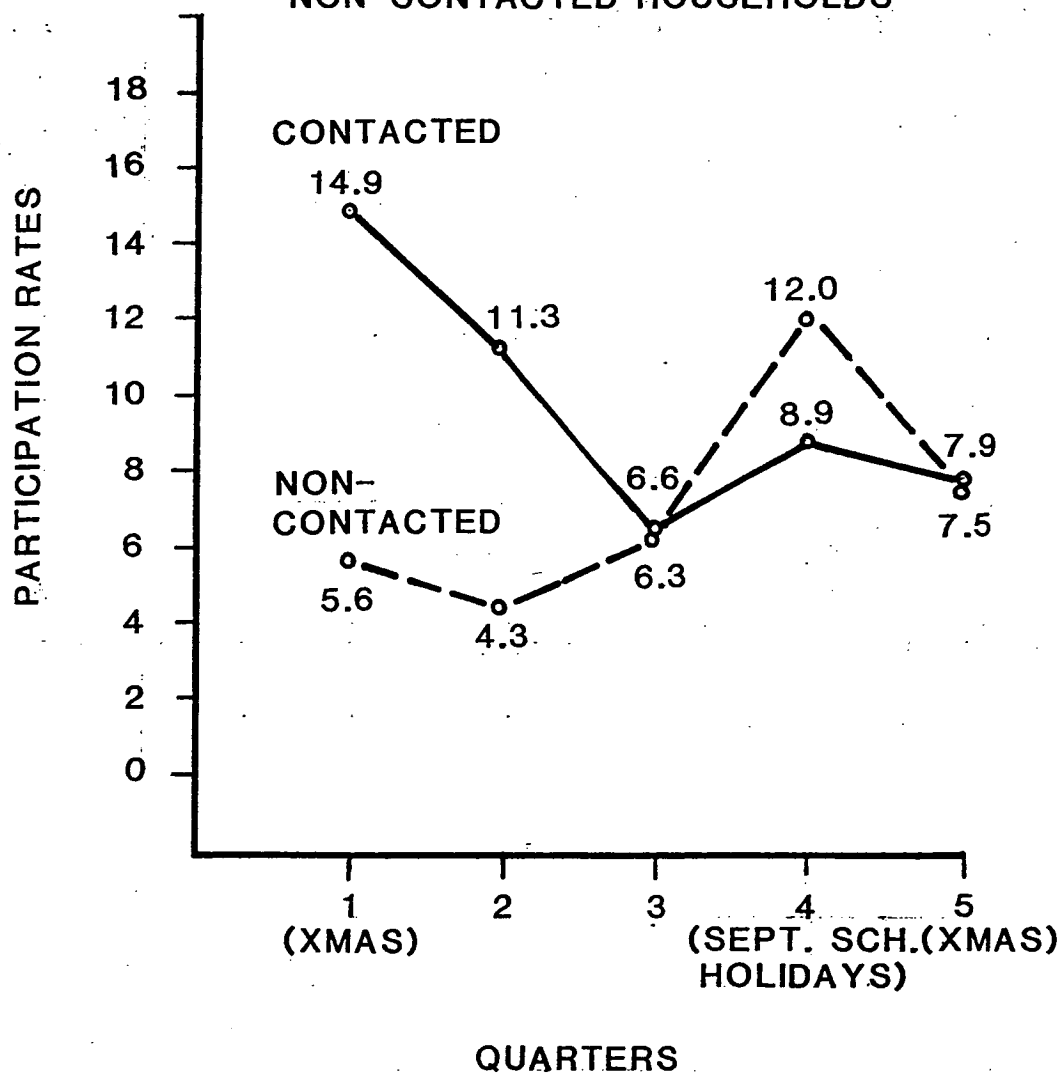


FIGURE 7-10 NEIGHBOURHOOD B PARTICIPATION RATES OF CONTACTED VERSUS NON-CONTACTED HOUSEHOLDS



**FIGURE 7-11 NEIGHBOURHOOD C PARTICIPATION
RATES OF CONTACTED VERSUS
NON-CONTACTED HOUSEHOLDS**



non-contacted group also exceeded the contacted group 9.3% to 7.2%. Only in Neighbourhood C did the contacted group continue to exceed the non-contacted group with 6.6% to 6.3%. This could suggest that the lower the socioeconomic levels are, the less influence residents have on their neighbours' behaviour.

Over the rest of the Project, the non-contacted households in Neighbourhood A exceeded the contacted in all quarters. The total average showed a near equalization of non-contacted 13.% to 12.8% contacted in Neighbourhood A. In Neighbourhood B, the non-contacted households equaled and surpassed the contacted with a total average of 9.2% to 7.4%. Neighbourhood C maintained a higher total average of contacted over non-contacted of 9.9% to 7.2%. Despite this small difference, the equalizing of participation rates confirmed the idea that the non-contacted groups would gain more in participation rates than the contacted as the Project continued.

Also, it shows that the non-contacted groups participation was fairly constant throughout the Project. The benefit of the personal contact wore off after 6 months. As the Project continued, the concept was realized that neighbours who saw the collection of recyclables would join in without having had a personal contact via the questionnaire survey. However, this is not to minimize the important of the initial personal contact, because its value in getting the Project started was confirmed by the data in the first 2 quarters.

The contacted group remained fairly consistent in their rate of participation throughout the Project, but the real gains were in the non-contacted group.

7.5 CONCLUSIONS AND IMPLICATIONS OF PURPORTED CONCEPTS

This section contains the conclusions and implications of the purported and tested concepts of the Study. There are 11 concepts discussed.

Concept 1 - that because of Neighbourhood A's higher socioeconomic status, more household participation would result in Neighbourhood A than in B or C because of the neighbours spreading the word to other neighbours about the Recycling Project.

This was confirmed in 2 ways. The overall data of participation showed that Neighbourhood A had a higher rate of participation than B or C over the duration of the Project. The second way the concept was confirmed was by the fact that A was still operating after 8 quarters and B and C were not.

The implication of the results of Concept 1 is that in higher socioeconomic neighbourhoods, publicity costs can be reduced significantly by assuming that neighbours will tell

other neighbours about the Project.

Concept 2 - that there would be a steady increase in Neighbourhood A's participation, while in B and C, because of their lower socioeconomic status, a slow but steady decline would result.

The steady increase concept was confirmed by the fact that A was still gaining at the end of the 8 quarters while B and C had dropped off sharply after the 5th and 6th Quarters. A's steady gain is depicted in Figure 7.1.

The implication for other recycling projects is that in a higher income areas, the prospects are good that the longer a recycling project continues, the greater the growth in participation is likely to be.

Concept 3 - that Neighbourhood A's higher purchasing power and consumption potential would mean that A would generate more \$ value of recyclables than B or C.

While the \$ value of recyclables in Neighbourhood A for the first 2 quarters did not exceed Neighbourhoods B or C by much, the \$ value of recyclables for A did eventually exceed both B and C. Figure 7.2 shows that A's on-going participation and commitment to recycling produced more \$ value of recyclables than B or C.

The implications are: 1) that the higher the socioeconomic neighbourhood, the higher the \$ values for the recyclables will be; and 2) the residents in the higher socioeconomic neighbourhoods will be less interested in doing their own collection and selling of the their recyclables. Rather, they are more interested in moving their recyclables on to a charitable agency for processing and sale.

The next three concepts centre on the responses that the householders gave during the initial questionnaire interview.

Concept 4 - that those householders who responded yes initially during the questionnaire survey when asked to participate in the Recycling Project, would be the most consistent participants during the Project.

The positive respondees did participate consistently higher than the negative and maybe groupings in all 3 neighbourhoods over the duration of the Project. The data in 7.3 confirmed this.

The implication for future recycling projects is to consider what the initial responses are before deciding on strategies to continue or change aspects of publicity or start collection in adjacent locations to the targeted areas. Using a 3 to 1 ratio, that is for every 3 positive responses, it is likely to produce about 1 actual participant. This can be generalized as to what

the actual participation is likely to be. This ratio could be used as a pre-determination of the required number of positive responses before embarking on a recycling project.

Concept 5 - that those householders who answered no or maybe would start participating once the Project started when they saw their neighbours participating in the Project.

Because people can and do change their perception and practices, it was useful to see how many householders in each neighbourhood changed from not participating to actually participating in the Project. When people see positive things occurring, they want to be part of it. This concept was confirmed by the data in 7.3.

The implication is that with positive feedback like the on-going collection of recyclables, a small but increasing % of negative and ambivalent householders will begin to participate in the recycling project despite their initial rejection of the idea.

Concept 6 - that the difference between what people said they would do and what they actually did in practice during the life of the Project would be significant. This was a key concept of the Study.

The data in 7.3 show that what people say and what they do in practice have a wide margin of difference. For any given quarter, in the positive groups, about 75% of the respondees did other than what they said they would do. In the negative groups, the percentage was 9% which did something different from what they indicated they would. This made a total of about 84% of the householders in any given quarter doing something different from their stated intentions.

The implications are: 1) one can expect only about 25% of householders who said yes to participating in the recycling project will actually do what they said they intended to do; and 2) those that said no to participating, will be more likely to not participate.

The next set of concepts deal with the section of 7.4 or contacted households versus non-contacted households.

Concept 7 - that those of the contacted households in all neighbourhoods would produce higher participation rates than the non-contacted households.

The concept that personally contacted households would participate in the Project at a higher rate was not borne out by the data. In Neighbourhood A and B, the non-contacted households overtook the contacted households by the end of the Project. Neighbourhood C's contacted households barely edged out the non-contacted households as described in 7.4.

The implication is that a brochure and the opportunity of seeing the collection process in action will produce results of participation at least equal to or greater than the more expensive form of personal contact publicity.

Concept 8 - that in Neighbourhood A, the non-contacted households would not need as much proding and persuasion to participate in the Project as would the lower socioeconomic Neighborhoods of B and C.

This was confirmed by the data of 7.4. The implication is, even with a minimum amount of personal contact, a recycling program is more likely to achieve a better response in the higher income areas than in the lower income areas.

Concept 9 - that there would be an equalization of participation between the contacted and non-contacted households over the life of the Project.

This concept was confirmed in Neighbourhood A and C over the test period. However, it was not confirmed in B as the non-contacted households recorded 9.3% participation rate and the contacted households dipped to 4.7% overall.

The implication is that even without on-going publicity and reminders, the keen participants would continue to participate whether they were contacted or not. This is because the initial burst of enthusiasm and commitment of the contacted residents tended to wane relative to the interest of the non-contacted householders' interest in participating because of the convenience of collection of the recyclables, the sense of community participation and/or by encouragement of the neighbour.

This reinforced the idea that with a good start among the contacted households, the non-contacted households would join in as the recycling project got established. In effect, this can save many \$ in questionnaire survey work and data collection.

Concept 10 - that non-contacted households would catch up in participation rates because of the example of neighbours and spreading the information via word of mouth.

This concept was confirmed after the 2nd Quarter in A and B. However, in Neighbourhood C, the contacted householders' participation exceeded the non-contacted householders' participation by 9.9% to 7.2%.

The implication is that word of mouth is important and predictable once a programme is in place, but the need for the programme to get up and running is vital to the successful operation of a recycling programme.

Concept 11 - that the households contacted at the time of the questionnaire survey would participate for the first 2 quarters at a greater rate than the non-contacted households.

The 3 tested neighbourhoods confirmed the concept that households contacted would participate at a greater rate for the first 2 quarters. The differences were marked in all 3 neighbourhoods. In A, the contacted to non-contacted for the first 2 quarters was 18% to 12.2% and 16% to 12%. In B, the contacted to non-contacted was 12.7% to 8.6% and 5.6% to 4.4%. Neighbourhood C had the largest difference with contacted to non-contacted was 12.7% to 8.6% and 5.6% to 4.4%. Neighbourhood C had the largest difference with contacted to non-contacted 14.9% to 5.6% and 11.3% to 4.4%. (See Figures 7-9, 7-10, and 7-11.

The last chapter summarizes the highlights of the Study, and gives the recommendations for a recycling strategy for Tasmania.

8 TOWARDS A RECYCLING MODEL - SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The summary and conclusions are broken down by the major headings for each section. The last part of this chapter contains the recommendations, which form the emerging strategy for recycling in Tasmania.

The Glenorchy Recycling Study demonstrated that over a two-year period a weekly, multi-material, privately-operated recycling project with no government support was not economically viable in any of the three test neighbourhoods. However, the highest socioeconomic neighbourhood came closest to being viable. In the middle and low neighbourhoods, the Project proved that recycling was a marginal undertaking. In the highest socioeconomic neighbourhood, there was a weekly shortfall of \$14 and in the other two neighbourhood there was a shortfall of \$16 per week over the same time period.

In the present Tasmanian context, recycling of domestic waste is uncoordinated and limited to private groups and companies. Most of the recycling of domestic waste is left to the individual householder who must either take their recyclables to a collection depot or the tip in relatively small quantities. The Boy Scouts or similar type groups do occasionally collect house to house. Some charitable groups, like St. Vincent de Paul, operate a house to house collection in small urban centres like Wynyard on the northwest coast of Tasmania. However, in the Hobart and Launceston areas, there are no regular house to house collection services. The Glenorchy Recycling Project was one of the first systematic and documented attempts at a house to house recycling project in Tasmania. It also was one of the longest in duration - over 2 years.

A successful recycling strategy requires an integrated approach (Quimby, 1975; Seaborg, 1974). In the Glenorchy Project, the need for the integrated approach was recognized and carried out. The Project was integrated from the design phase, through the questionnaire survey, the waste compositional analysis to the collection and marketing of the recyclables.

No one recycling scheme can provide the final answer to an effective recycling strategy (Cook & Malcolm, 1981; Crawford, 1979). Recycling is a difficult and time-consuming social activity. All schemes must relate to the local needs and the economic realities of the market place to be successful (King, 1980; Perry, 1978). This Study broke new ground in Tasmania and should prove to be useful for other recycling projects in Tasmania, Australia and similar parts of the western world.

8.1 QUESTIONNAIRE SURVEY - SUMMARY AND CONCLUSIONS

The Questionnaire Survey represents a benchmark in recycling data for Tasmania. Questionnaire surveys are vital to the start of most recycling projects. The Questionnaire Survey, with its component of relating what people said they would do against what they actually did, was a unique aspect of the Study. The Questionnaire Survey, conducted in the October and November of 1981, was used as a pre-project publicity technique. This publicity technique was successful in gaining essential data from the interviewed householders and in establishing an effective way of reaching about 50% of the householders prior to the start of the collection phase of the Recycling Project. The data showed that in the first two quarters, the contacted householders kept the Project going and set the example for the rest of the neighbourhood by their participation.

The results of the Questionnaire Survey were significant in providing information about the way people dispose of glass, paper, aluminium cans and other components of the waste stream. It was also important in gaining an understanding of peoples' attitudes to waste management.

It was learned that almost one quarter of the sampled householders said they discarded their refillable bottles in the normal garbage for weekly collection. Almost 6 out of 10 householders said they attempted to recycle their refillable bottles, while 16% said they did not buy refillable beverage bottles. These data showed that the potential of collection of refillable bottles was about one household in four. It also meant that for householders who took their bottles to the tip or another collection point, they would have a more convenient method of usefully recycling their bottles with the house to house collection system.

The refundable deposit bottle was valued by over half of the householders who said they returned their deposit bottles for refunds. About 8% said they discarded their deposit bottles in the normal garbage. It was a revelation how many people did not bother to refund their deposit bottles. The data showed that there was significant scope for deposit bottle recovery as well as the recovery of refillable bottles.

The non-refillable, or one-trip bottle, was discarded in the normal garbage by 55% of the sampled residents. The ease of discarding a one-trip bottle suggested that the majority of householders placed little or no value on the non-refillables. These data reinforced the argument put forth by the pro-deposit legislation lobby which argue that if a deposit is not on the bottle, it will end up in the waste stream.

Overall, about 8 out of 10 householders said they either recycled or reused their refillables and deposit bottles. In addition to the 20% to 25% of householders who didn't reuse or recycle their refillables or deposit bottles, there was considerable scope for increased recovery of glass cullet from the non-refillables and glass jars in all neighbourhoods.

Deposit legislation was supported by about 80% of the surveyed householders as the best solution to the litter problem and for ensuring that more bottles would be recovered. The residents agreed that they would be willing to pay extra for beverages if it meant more recycling/reuse and less litter on the streets and in the parks.

It was found that 39% of the sampled householders disposed of their paper waste by means of an outside incinerator. There were 28% who said that they disposed of their paper waste in the normal garbage collections. Overall, there were only 11% who attempted to recycle their paper waste.

Aluminium cans represented a small total quantity of beverage containers (about 12%), but a potentially valuable material to recycle. In 1981, only about 5% of the householders said they attempted to recycle their aluminium cans.

When asked if recycling was worthwhile, almost 84% of the surveyed householders agreed or strongly agreed that it was. Recycling as a concept was deeply rooted in many people as a desirable ideal. However, when asked to participate in the Glenorchy Project, only 64% said they would.

The Questionnaire Survey model could be used by other communities faced with a low budget, community-based, recycling project. For example, the model could be employed to update attitudes and householders' habits for communities contemplating a source separation recycling programme. It could also be used as a pre-project publicity tool in targeting neighbourhoods for collection.

8.2 WASTE COMPOSITIONAL ANALYSIS - SUMMARY AND CONCLUSIONS.

The Waste Compositional Analysis was the first one carried out in Tasmania. Despite the one-off approach due to limited money, time and workers available, the data do give a good indication of the relative composition of domestic waste in the 3 test neighbourhoods. Chapter 5 detailed the various components and their percentages of the total waste stream.

The weekly average of domestic waste per household was 6.9 kilograms in 1981, compared with the Australian national average of 8.8 kilograms as reported by Pausacker and Andrews in 1983 (Pausacker & Andrews, 1983).

In 1981, Glenorchy's sampled householders consumed less disposable materials and/or recycled more of their waste materials than the national average. Both the Questionnaire Survey and Waste Compositional Analysis showed that a sizeable proportion of the residents were recycling bottles and paper. Food wastes overall accounted for the largest percentage of domestic waste, 52% by weight. Glass accounted for 16.7% overall, while paper accounted for 14.2% by weight overall. Plastics made up only 6.8% by weight.

Food wastes was the largest component in the Glenorchy waste stream. Food wastes were disposed of in the regular garbage collection by 44% of the sampled residents. The implication of these data on food wastes is that a education programme on recycling opportunities needs to address food wastes as a special category (CSIRO, 1978; Environmental Conservation, 1980; Singley, 1987).

The potential for recycling paper was estimated at 80% for Australia (Boyd, 1982). With new products being made from waste paper by A.P.M., the demand may increase as the product diversification of the manufacturers moves beyond the traditional egg cartons, toilet paper, and packing sheets. For Glenorchy, the collection of paper waste offered a good potential if markets could be maintained.

The small amount of aluminium cans in Southern Tasmania makes it a less significant recyclable at this time. However, as the penetration of aluminium cans begins to impact the Hobart market, aluminium cans could become a more important component of the waste stream. The Glenorchy data showed that 67% of all householders discarded their cans in the normal garbage collection. At this stage, recovery of aluminium cans will be primarily by way of the group approach, usually carried out by clean up crews after football games. The value of aluminium cans will need to increase before a commitment to the recycling of cans can be made. The collection and sale of aluminium cans offer less possibilities because of the limited quantities consumed in the household.

Steel cans will continue to be one of the main components of the waste stream. However, it is unlikely that the steel can will be economically viable to recycle in the near future.

Plastics will continue to increase in total weight as more packaging is in plastic. Also, the concern of plastics' potential as a hazardous waste is increasing. The implications for increased use of plastics in almost every product used are only now being researched and labeled.

8.3 THE RECYCLING OPERATION - SUMMARY AND CONCLUSIONS

The Glenorchy Recycling Operation was based on the concept that a charitable agency, namely St. Vincent de Paul, could incorporate a house to house, weekly, multi-material collection of recyclables into its existing programmes using handicapped workers.

The 3 test neighbourhoods were contacted initially via the questionnaire survey or by a brochure describing the Project. This is described in Chapter 4 and summarized in 8.2.

After 6 weeks into the Project, a follow-up brochure was distributed to all households in the 3 test neighbourhoods. This served to remind residents that the Recycling Project was on-going.

The operation strategy was to have the collection day one day before the regular collection day, so that if any residents were late in putting out their recyclables, the regular garbage collectors would pick up the recyclables with the regular garbage. In this way, there would be few complaints from the residents that their recyclables were not collected. This strategy worked well as there were few problems cited by residents in terms of collection of the recyclables on a weekly basis.

The Glenorchy St. Vincent de Paul's store and depot were centrally located. There was a relatively smooth process established for unloading the recyclables at the depot. Initially, it was attempted to do some of the sorting enroute, but this proved less efficient than sorting the recyclables once the truck returned to the depot. The added advantage to the sorting at the end of the collection was that the driver could more closely supervise the handicapped workers.

Improvement of participation may have been achieved if the budget for publicity had been larger. However, part of the test of the Study was to see what a neighbourhood could achieve on a low publicity budget.

The opportunities for cutting costs were extremely limited as the whole operation was premised on a bare-bones approach. Two significant cost cutting moves were implemented. The first was changing the collection vehicle from a 3 tonne to a 1 tonne truck. This improved maneuverability during the collection phase helped reduce the overall collection time and cost. The second cost saving approach was the termination of the lease of the Hull Street Depot. This meant consolidation of the operations and storage of the recyclables at the Mill Lane store and depot of St. Vincent de Paul. The consolidation at Mill Lane reduced the need to supervise workers away from the main depot. The supervisor could be involved in other duties at the Mill St.

store and still keep an eye on the workers.

It can be concluded that the operations were efficient within the context of the St. Vincent de Paul's operating limits. Storage capacity was essential in such an operation in order to be able to wait out the lows in prices for the recyclables. St. Vincent de Paul had to balance the necessity of storage of recyclables against their primary role of receiving used furniture and clothes for the less well off in the Glenorchy area.

The storage capacity proved sufficient for the 2 years of operation. However, if the recycling project were to have expanded, then new facilities may have been required.

8.4 RECOMMENDATIONS

In this section, the recommendations for establishing an effective recycling programme for Tasmania are listed below:

1. For Tasmania, it is important to establish a recycling system which is flexible and small scale. A large scale, centralized waste recovery plant is not appropriate in Tasmania. Research for this Study has shown that large scale centralized disposal plants are very expensive to build and maintain, especially for cities less than 1 million people (Skitt, 1978). Tasmania, with its small and decentralized population, divided among the southern region (Hobart), the northern region (Launceston), the northwest (Devonport to Burnie) and the western region (Queenstown), does not generate sufficient waste to warrant a centralized system (Richards & Hawlicek, 1978).

Additionally, Tasmania's landfill sites have expected lives of well over 20 years. Potential landfill sites are easily available and relatively inexpensive. Landfill disposal of waste is still the least expensive option when compared to centralized systems.

2. Governments, both state and local, should not subsidize the collection/recycling of materials directly. Rather, a yearly grant should be made by the local councils to any charitable/private organization which officially applies for a grant, based on the total cost savings of diverted recyclables from the landfills in the individual council areas. For example, if St. Vincent de Paul diverts 100 tonnes of materials from the landfill and the council calculates that 100 tonnes is 1/100 of the yearly amount of material landfilled, and the annual cost to the council is \$100 000, St. Vincent de Paul would be eligible for a \$1000 annual grant. This would mean that both the collecting agent and the council would have to be more attentive to the data on landfill costs and collection of materials. The principle should be that councils only pay for that amount which they would otherwise have to pay for landfill costs.

Another way of calculating the grant would be to use the idea of "avoided cost." Avoided cost is the amount that it would cost the council if the diverted wastes were not recycled and would need to be landfilled. For example, of the \$1000 grant, only 40% may have been an avoided cost because the council would have equipment, men and administrative overheads, as on-going costs anyway. Therefore, it could be argued that a recycling agency should be granted only \$400 instead of the \$1000.

This recommendation assumes that a total figure for the council's waste is annually estimated. The recycling agents (charitable organization) would be required to calculate their waste by the monthly sale figures given by the purchasing companies of bottles, glass cullet, paper and cans. These would be submitted to the council on a quarterly or half yearly basis for payment. This would avoid the criticism that governments must subsidize recycling projects to make them viable (Skitt, 1978). It also would encourage charitable and private groups to try recycling because they would be given an incentive to increase their collection because they would receive the monies from both the sale of the recyclables and the grant from the councils. This novel approach would also avoid the criticism of unfair monopolizing of the waste business. It would be open to any private group who could show that they have a bona-fide recycling operation.

This method would also solve the problem of passing the costs onto the state governments. The local councils could provide their own added incentive if they were particularly short on landfill space.

In summary, the recommendation for a yearly grant by the council should result in the following: 1. foster greater awareness of the total waste being landfilled; 2. encourage councils to more accurately determine the costs of landfilling; 3. encourage private and/or charitable groups to start recycling projects because they would be receiving recognition and the accompanying monetary return for their efforts; 4. remove the arguments that governments must subsidize recycling activities; 5. recognize the existing business, social and governmental networks which are already established to deal with recycling; and 6. allow the local councils flexibility to work out their incentives depending on the future life of their landfill. This would benefit the total community by preserving a longer life for the landfill.

3. A recycling coordinator's position should be made a permanent position in the Department of the Environment. The Minister for the Environment would need to seek a positive decision from Cabinet to create the position. Interpreting the Solid Waste Management Act in its broadest sense, there would be no need to change the Act itself. The coordinator's roles would include the marketing of recyclables, researching potential new

products from recycled materials, and generating interest for recycled products among councils, private and charitable groups.

The main emphasis of the recycling coordinator should be on establishing markets. The state government should take the lead in purchasing recycled paper. Even if the price is 5 - 10% more costly, the state government should purchase recycled paper to help foster a local market for the product. Other organizations should be contacted to also purchase recycled paper (Keller, 1983). This would increase the job creation opportunities for people most in need (Skitt, 1978). Contracts between sellers and purchasers would be at least on a yearly basis so that the collecting agents would have an assured price for a set period of time. The coordinator would assist the sellers of recyclables to gain the appropriate contracts, if the sellers desired the coordinator's involvement. The coordinator's position would raise the profile of recycling in the community. As other studies have shown, there is potential for new markets as the southeast Asian countries presently import million of tonnes of waste paper annually.

The large packaging companies would be expected to contribute one-half of the coordinator's salary. Their contributions would be based on a percentage of their gross sales in Tasmania. The councils would be expected to contribute one-quarter and the state government one-quarter towards the coordinator's salary. The benefits of the coordinator's role would be as a contact person for the collectors, buyers and sellers of recyclables and the processors. The coordinator would have a definite brief to promote recycling at all levels. The position would be a catalyst for working out strategies for increased recycling in Tasmania.

After markets have been established, the coordinator would target the highest socioeconomic neighbourhoods in the main urban centres. These neighbourhoods should be the first focus of any recycling source separation collection scheme attempted. Councils with positive attitudes to recycling should be the initial start-up areas for the first recycling scheme/s. All private and/or charitable groups would be notified and allocated, if interested, a prescribed geographic area for collection. Publicity for the schemes should be the calendar/brochure mailed out by the councils for the targeted collection districts. This would serve to make the scheme official and to cut down on extra costs for the collectors of the recyclables.

4. The materials that should be collected are glass and paper in the southern region of Tasmania. At this point, it is not worthwhile to go beyond these materials in a house to house collection system because of the problems cited in this Study. The collection should be weekly, as was done in the Glenorchy Recycling Project. The actual coverage of neighbourhoods should be increased by 2 collection districts to ensure sufficient amount of materials are collected in each

run. (This should be about 1000 households per day.) Monetary incentives to the householders, like the examples in Rockford, Illinois, where randomly selected householders' garbage is checked on collection day to see if they have separated the recyclables from the non-recyclables, should be considered. If the householder has separated the recyclables, they would win \$200. This incentive could be done once per month (Haitch, 1986). This would serve to increase the householders' participation and heighten the awareness of the value of recycling.

Aluminium can collection should be concentrated in the north of the State to be within a relatively short distance to Bell Bay's Comalco's processing plant. However, as increased usage of aluminium cans occurs, expansion into the Hobart area could occur.

5. Promotion of deposit legislation should be considered, as over 85% of residents surveyed in Glenorchy felt it would be a desirable law to have. The use of standardized refillable containers to help the handling, sorting and reuse of bottles should be considered.

6. Because food wastes comprise over 50% of the waste stream, an educational programme for on-site composting should be undertaken. This project could be carried out by Community Youth Support Scheme (CYSS) and/or similar groups (Knight, 1979).

7. In the more isolated areas of Tasmania, there should be strategically-placed containers in shopping centres and other community spaces for the individuals' convenience of placing their recyclables for collection and recovery. A back-loading network should be established to minimize transport costs of recyclables to the processing points.

8. Charitable organizations have played a major role in the recycling operation in Tasmania. They have provided an outlet for used furniture, clothing and household goods. The Society of St. Vincent de Paul, Salvation Army, Hobart City Mission, Life Line, and Walkabout Workshop have built up networks to collect, store/sell/repair and distribute goods to their communities. St. Vincent de Paul, the collecting agency for this Project, also provides sheltered workshops for handicapped and disabled persons. These groups have tended to see the recycling of domestic waste (glass, paper and cans) as an extra, rather than as part of their overall strategy. The Glenorchy Recycling Project broaden their approach as the recycling of glass, paper and cans was seen as complementing the existing furniture/household goods recycling. The role of charitable organizations in recycling will be significantly enhanced by Recommendation 2 which emphasizes that a council grant based on the charitable organizations' capacity to divert waste from the landfills be made. The grant system will enable the charitable groups to see recycling as at least a breakeven proposition, depending on the amount and duration of the chosen recycling

project. It should prove to be a boon to the charitable groups which elect to take up recycling, either a house to house source separation approach or the stationary approach of a recycling depot.

9. A need exists to set up a state committee to examine those waste products which are either hard to treat or are potentially hazardous to the environment. This should be advisory first, but with the possibility of progressing to an authority with a regulatory role, under the Department of the Environment. Part of the Committee's role would be to encourage the design of products for longer life, and to design product for recycling at the end of their life. The Committee would be chaired by the recycling coordinator.

Finally, recycling will become economically viable when the four aspects below come together: first, the cost of landfills and other disposal options exceeds the cost of collecting and processing the recyclables, forcing councils to look for alternative disposal options; second, a shortage of raw materials occurs, which increases the value of the recyclable to a point greater than the virgin material; third, when councils and individuals internalize the need for the careful use of resources; and fourth, when an integrated, easy, convenient recycling network is established. Until these four aspects become a reality, the above recommendations should achieve a positive climate to promote recycling at a minimum of cost to the public or private sector.

This Recycling Project in Glenorchy has been a valuable example of what can be done on a very low budget. It should as a model for increased recycling activities in Tasmania. The Glenorchy Recycling Project is one more step towards developing a recycling ethos in Tasmania.

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APPENDIX A - INTRODUCTORY LETTER FOR THE QUESTIONNAIRE SURVEY
AND A SAMPLE OF THE QUESTIONNAIRE

APPENDIX B - LETTERS FROM DEPARTMENTS AROUND AUSTRALIA
REGARDING RECYCLING ACTIVITIES IN THEIR STATE

APPENDIX C - OTHER RELEVANT LETTERS

APPENDIX A

Dear Householder,

COMMUNITY RECYCLING PROJECT

Over the next few weeks, we will be conducting a questionnaire survey in your community. The purpose of the survey is to help us gain a better idea about what people are doing with their discarded waste materials.

The survey is part of a community research project in conjunction with the University of Tasmania, the Tasmanian College of Advanced Education, St. Vincent de Paul and several local companies involved in recycling.

The Society of St. Vincent de Paul will begin the collection phase of the project shortly after the questionnaire survey is completed. You will receive official notice of the beginning date and time.

Each household participating in the project will be asked to separate their glass; - bottles and jars; clean paper waste like newspapers, magazines and books; and aluminium cans from the regular garbage. Once a week the Society of St. Vincent de Paul will collect your items from the kerbside. The householder will be asked to place these items in cardboard cartons for pickup.

We would like to hear your ideas and thoughts on what can be done on a personal as well as a community level to improve the re-use of discarded items.

Your answers will help us assess the prospects for a recycling programme in your community. All answers will be kept strictly confidential. The questionnaire should not take longer than 10 minutes. Your cooperation and participation in this source separation recycling project will aid the community, the individuals participating and the Society of St. Vincent de Paul.

For further information, please ring David L. Clouser at 203270 during the day.

Sincerely,

David L. Clouser,
Leader of Project.

VOLUNTARY DOMESTIC SOURCE SEPARATION

RECYCLING PROJECT QUESTIONNAIRE

AUGUST 1981

Hello my name is Here is
a letter regarding a Questionnaire Survey about Recycling in the Community.

GLASS

First, we would like to ask some questions about your present practices and ideas
on what you do with discarded glass.

1. How do you usually dispose of your "refillable" beverage bottles like
beer and cider bottles?
 - (a) Discard the bottles in your normal garbage collection.
 - (b) Store them for future collection by a community service or
charitable group.
 - (c) ~~Return~~ Return them to a buy back centre. (Tasmanian Bottle Company).
 - (d) Give them to a Recycling Centre or collection depot.
If so, where?.....
 - (e) Other.....
2. There are other beverage bottles which are refillable and carry a refundable
deposit. Many soft drinks carry such a deposit.

How do you usually dispose of your "deposit" beverage bottles.

- (a) Discard the bottles in your normal garbage collection.
- (b) Store them for future collection by community service or
charitable groups.
- (c) Return them to a store for the refundable deposit.
- (d) Take them to a Recycling Centre or collection group depot.
If so, where?
- (e) Other

3. Some glass beverage bottles are not designed by the manufacturers to be refilled.

How do you usually dispose of your "non-refillable" beverage bottles?

- (a) Discard the bottles in your normal collection.
- (b) Store them for future collection by a community service or charitable group.
- (c) Take them to a recycling centre. If so, where?
- (d) Other.....

4. How do you usually dispose of glass jars?

- (a) Discard them in the normal garbage collection.
- (b) Save them and give them to a charitable group.
- (c) Other

PAPER WASTE

5. How do you usually dispose of your paper waste, like newspapers and magazines?

- (a) Dispose of it with the regular garbage.
- (b) Put it out separately for regular garbage collection,
- (c) Burn it in an outside incinerator.
- (d) Burn it inside, either in open fire or wood stove.
- (e) Separate and take the paper to a recycling centre.
- (f) Other

ALUMINIUM CANS

6. How do you usually dispose of your empty aluminium drink cans?

- (a) Put them in with other garbage for regular collection.
- (b) Separate them and take them to a Recycling Buy Back Centre.

7. In some places to encourage recycling and to reduce litter there are laws which require refundable deposits on all beverages sold. Often these deposits mean a slightly higher price for beverages.

Do you feel that such a law would be a good thing for Glenorchy?

- (a) Strongly agree.
- (b) Agree.
- (c) Undecided.
- (d) Disagree.
- (e) Strongly disagree.

8. How often do you make a trip to the tip because of excess rubbish?

- (a) Frequently (once per week).
- (b) Occasionally (once every two months)
- (c) Seldom (once per year).
- (d) Never.

9. When you dispose of your food wastes which of the following do you usually do?

- (a) Mix them with the other regular garbage.
- (b) Feed them to household pets.
- (c) Feed them to chickens.
- (d) Compost them.
- (e) Other.....

10. If some of your garbage could be usefully recycled, but to be economically feasible you would have to separate those items from the regular garbage, do you agree that it would be worthwhile to do so?

- (a) Strongly agree.
- (b) Agree.
- (c) Undecided.
- (d) Disagree.
- (e) Strongly disagree.

Now we would like to ask you a few questions for background purposes. Your cooperation would greatly aid us in finding out how different people feel about the topics we have been examining.

11. Now to begin with, could you tell us how many people live in your house/flat?

.....

How many of these are under 18 years of age?

12. Please indicate the level of education you and the other adults in your household have completed.

..... Other adults (1)

(2)

(a) Primary education. (3)

(b) Left school before Grade 10. (4)

(c) Completed high school. (Grade 10).

(d) Completed Grade 11 or 12.

(e) Technical College or Trade Apprenticeship.

(f) Tertiary College or University.

13. Could you point out your job situation from the options below

Other adults (1)

(2)

(3)

(4)

(a) Blue collar worker.

(b) White collar worker.

(c) Housewife-househusband.

(d) Student.

(e) Unemployed.

(f) Social security beneficiary.

(g) Aged Pensioner.

(h) Other

14. Could you indicate your annual household income?

- (a) \$8000 or under.
- (b) \$8001 to \$15000.
- (c) \$15001 to \$25000.
- (d) Above \$25000.

15. What do you think is the most serious waste issue facing the Glenorchy area today?

This finishes the questionnaire. Do you have any questions about the collection phase of the project described earlier? Those participating will be asked to sort their glass, paper and aluminium cans for collection by St. Vincent's de Paul.

16. Do you wish to participate in this community recycling project?

- (a) Yes
- (b) No
- (c) Maybe

A brochure describing the details of when it will begin, what day and other general instructions will be distributed to you in the near future.

Thank you for your time and cooperation.

APPENDIX B



Department of Environment and Planning

55 Grenfell Street.
Adelaide. South Australia 5000
Telephone (08) 216 7777

G.P.O. Box 667.
Adelaide.
South Australia 5001

Reference DE 3899/77
Contact Officer

Pollution Management Division

Mr. David L. Clouser,
Lecturer,
Tasmanian College of Advanced Education,
Hobart Study Centre,
P.O. Box 1415P,
HOBART. TAS. 7001.

Dear Mr. Clouser,

Thank you for your letter of the 19th April, 1983, in which you request information regarding source separation and recycling projects in South Australia.

In South Australia the only legislation which deals specifically with recycling is the Beverage Container Act, 1975-1976. The report - A Study into the economic impact of the South Australian Beverage Container Act and Departmental pamphlets on Recycling are enclosed for your information.

In relation to other aspects of recycling, there are no government edicts in force controlling source separation or recycling in general. Some Local Councils introduced trial periods of source separation as a part of their normal rubbish collection system. Various charitable organisations and waste collection services rely on source separation of collectable items as part of their salvage operations.

The main charitable organisations operating in South Australia are:-

Goodwill Industries, 44 Cavan Road, Dry Creek, Mr. R. Henry
Salvation Army Social Service Department, 62 Whitmore Square, Adelaide
St. Vincent De Paul Society, 82 Flinders Street, Adelaide

Industrial Waste Collectors also using some form of waste separation and recycling are:-

McMahon Waste Disposal, Prospect Road, Gepps Cross
Cleanaway Waste Disposal, Francis Street, Gillman
R.A. & D.P. Hopkins, Wing Street, Wingfield (Liquid Works)

.../2..

Mr. Rod Maddox the Director of the South Australian Waste Management Commission and Mr. Brian Hill of the Local Government Department may be able to supply further information which may assist you.

I trust that this information has been of some help to you and I would be interested in receiving any reports or information you may publish.

Yours sincerely,

A handwritten signature in dark ink, appearing to read 'G.R. Inglis', with a stylized, cursive script.

(G.R. Inglis)
DIRECTOR,
POLLUTION MANAGEMENT DIVISION



Department of Territories and Local Government

G.P.O. Box 158, Canberra, A.C.T., 2601
Telephone: (062) 46 2211

Telephone:

In reply please quote:

Your reference:

Mr David L Clouser
Lecturer
Tasmania College of Advanced
Education
P O Box 1415P
HOBART 7001

Dear Mr Clouser

I refer to your letter of 19 April 1983 in which you sought information on recycling projects in the ACT.

This Department provides a range of recycling facilities at its two major landfill sites and at a number of other locations, for the collection or recycling of the following materials: glass, paper and cardboard, steel cans, aluminium, oil, clothing and pine offcuts.

Recyclers are allowed to remove these materials from the facilities without payment of fees or royalties to the Department. The pine offcuts are dumped at one of the landfill sites and may be taken away by householders as required. However, it should be noted that removal of any materials from the working face of the tips is not permitted.

There are two private companies carrying out private recycling operations, one handling glass and the other sawdust. The Department is not privy to the operations or volumes of these concerns. However it is known that the sawdust is used for the manufacture of garden mulch, and that about 1700 tonnes of glass products are collected for recycling annually.

One firm collects paper products from householders for recycling. Details of this firms operations can be seen ... on the attached sheet. Whilst the information contained therein is not restricted it would be appreciated if it was not used as a specific model due to the firms unique position in the market place.

2.

The Department has given several local charities permission to locate approximately 100 clothing recycling bins at various locations (shopping centres etc) throughout Canberra. We are advised that, on the whole, these have been very successful.

It is hoped that this information is of some assistance to your research. We would be grateful for any feedback which you may be able to provide.

Yours sincerely

A handwritten signature in cursive script, appearing to read 'A. Lee'.

A Lee
for Assistant Secretary
Technical Services

7 - 6 - 83

1. NAME OF PROJECT
'logo'
"PAPER CHASE"
2. ~~CITY/SUBURB~~/MUNICIPALITY
MUNICIPALITY
3. STARTING DATE OF PROJECT - is it still operating or finished?
APPROX 1977 AND ONGOING
4. HOW MANY HOUSEHOLDS INVOLVED?
APPROX 72,000
5. FREQUENCY OF COLLECTION
~~Weekly, Fortnightly, Monthly~~
Monthly
6. MAIN TYPE OF PUBLICITY
a. ~~Newspaper~~
b. ~~Letters~~
c. ~~Council Notices~~
d. Letter box drop of calendars with pickup dates
7. MAIN SPONSOR AND COLLECTOR
a. ~~State/~~ name
b. ~~City/Town~~
c. ~~Charitable group~~
d. private enterprise
8. RECYCLABLES COLLECTED
a. ~~glass~~
b. paper and cardboard
c. ~~aluminium~~
d. ~~steel cans~~
e. ~~organics~~
f. ~~other~~
9. WHY DID THE PROJECT START?
a. conservation
b. ~~lack of tip space~~
c. ~~employment~~
d. private enterprise and government encouragement
10. CHIEF MARKETS FOR RECYCLABLES
Melbourne/Brisbane
11. UNIQUE ASPECTS OF THE PROJECT
First to introduce calendars with circled collection dates initially increased collections by 300%
12. PARTICIPATION RATE OF HOUSEHOLDS
APPROX 40%
13. EVALUATION OF THE PROJECT. ~~Has it met the stated goals?~~
Has slightly exceeded original goals



State Pollution Control Commission



Mr. David L. Clouser,
Tasmanian College of Advanced
Education,
Hobart Study Centre,
P.O. Box 1415P,
HOBART TASMANIA 7001

157-167 Liverpool Street
Sydney 2000
G.P.O. Box 4036
Sydney 2001

Our reference: 706497 DT:MZO

Your reference:

Telephone: 266 0661

16 MAY 1983

Dear Mr. Clouser,

Thank you for your letter of 19 April on source-separation recycling projects.

We do not know of any integrated project to separate garbage into all the categories you name, or any scheme operated by local authorities themselves to separate recyclable materials. Even in Sydney, therefore, we do not have the sort of statistics that would make it possible to fill in your questionnaire, and we believe this is also true of the Metropolitan Waste Disposal Authority. In country areas our knowledge of garbage collection is even more fragmentary.

Though operations vary somewhat from one local authority area to another, the general procedure in Sydney suburbs is a twice-weekly collection from household garbage bins, supplemented by a general clean-up at periodicities ranging from about two to six months. In various areas including Penrith and Campbelltown City and Rockdale and Ku-ring-gai Municipality - 120, 240 or 340 litre carts, instead of ordinary garbage bins, are collected once a week. Garbage from commercial premises and street litter bins is collected frequently. In either case, taxation has discouraged garbage collectors from separating salable ingredients from other refuse in bins; and once garbage has entered a compactor, local authorities regard it as irretrievably mixed and do not attempt to separate materials at landfill depots. At one time licensed "scavengers" were allowed to operate at these locations, but for public health reasons their licences seem now to have been withdrawn.

Many local authorities encourage householders and others to separate valuable components from the garbage at source. The householders either take these to receipt depots, usually privately run, or leave them on the footpath at specified times to be collected by recyclers or their authorized agents. These are usually commercial merchants or sheltered industries, but service clubs, Boy Scouts, Girl Guides and other voluntary bodies may be involved. Such bodies may also make ad hoc door-to-door collections, "milk" litter bins or organize clean-ups of waste land. The size and extent of these operations really depend on the market provided by the major recycling industries. This is dictated more by national than local considerations and depends upon the cost of raw materials and energy, the overall state of the

economy, demand for particular types of recycled materials, technological capacity to recycle wastes, and other factors. The situation in New South Wales may not, therefore, be very different from that in Tasmania; but it is at any rate more convenient to outline on an industry, rather than a "project", basis, as follows:

Glass

Glass is manufactured and recycled in Sydney by two major companies: Australian Consolidated Industries-Australian Glass Manufacturers (ACI), operating east of Parramatta; and Smorgons-Glass Containers Ltd (GCL), operating to the west. Presumably for geographical reasons, Campbelltown City and Hornsby Shire are the only areas where fortnightly or monthly (indicated on distributed mini-calendars) house-to-house collections are not made. Bottles can also be taken to "buy back" recycling centres or left with local charities. ACI claims to have pioneered bottle recovery and recovery and recycling in 1966 with a collection depot at the Royal South Sydney Hospital - the start of the Hospitals and Charities' Bottle Recycling Programme. It also says that more than 50 per cent of all new glass bottle production consists of recovered glass from collection schemes and rejects from the production line. GCL says it does not record a breakdown of components. Together, the two companies service 850,000 Sydney households with door-to-door collections, and recover the equivalent of 220 million bottles in New South Wales annually.

Paper

Until recently, Australian Paper Manufacturers arranged for regular (about every six weeks) door-to-door collection of waste paper. It claimed an annual recovery of 400,000 tonnes (one-third from New South Wales) of paper and cardboard throughout Australia and the use of about 50 per cent of waste in its fibrous raw material. Today only about six local authority areas in Sydney have house-to-house collections, about 85,000 tonnes of paper are recycled in New South Wales and most agents without long-term contracts find collected waste is no longer acceptable. Apart from the economic downturn, a move from paper to plastic packaging and growing opposition to excessive packaging are responsible for this decline. (Like most materials, paper loses quality on recycling and waste paper is most suited to the manufacture of cardboard and kraft paper). The collection of used paper will shortly be reviewed.

Aluminium Cans

In New South Wales about 90 per cent of cans used are made of aluminium. There is no organized door-to-door collection by industry, but cans may be collected from householders by service clubs or youth organizations. Throughout Australia, mainly at shopping centres, there are about 800 "reclamation centres" where cans can be delivered for recycling by the two companies making aluminium cans, viz, Comalco and Alcoa. Recycling schemes began in Australia in 1973, and it is said they have created 600 new jobs and save 95 per cent of the energy required to manufacture the original metal. Currently, about 65 per cent of all cans used in New South Wales are reclaimed and recycled.

Steel Cans

These are not used for beverages canned in Sydney, but are used in the steel cities of Newcastle and Wollongong (and in Canberra). In these cities BHP has introduced a steel-can recovery programme, which is already recycling about 20 per cent of cans used.

Plastics

As you know, plastics are not, as a rule, recycled from used material, though they are from offcuts and other industrial wastes. Collection is said to be generally uneconomic because of the high volume and low weight of many plastics. Furthermore, the industry claims that, after emptying the original contents, consumers may put chemicals into plastic containers which degrade the material. It is also degraded by ultraviolet light. Moreover, some plastics are "thermosets" which cannot be recycled, while others that look identical are chemically different and incompatible in the recycling process. The main exception to this rule is PET (polyethylene terephthalate) bottles, which are manufactured by the two big glass companies. Currently only GCL collects them, as an adjunct to its glass-collection programme, and recycles them. ACI is jointly funding a research project with GCL, but will not yet accept used PET bottles.

Other Materials

The Metropolitan Waste Disposal Authority has facilities to take back waste lubricating oil. It is also conducting research into producing, from arboreal waste, "chipmulch" to aid the revegetation of regional depots (and other places).

Simsmetal and Metal Recyclers will accept without payment old motor vehicles delivered to their depots. They will collect vehicles in the Sydney metropolitan area but charge the owner or local government authority a collection fee of about \$25 per vehicle. Abandoned vehicles are now collected by the local council and not by the police. A few years ago the metal recyclers used to buy old vehicles, but increased operating costs and reduced commodity prices are cited for the abandonment of this practice. The companies are interested only in metals. Other materials are disposed of at landfill.

In the above analysis, "recycling" is taken to mean reprocessing of material and not reuse of a manufactured product. The only items in the latter category in New South Wales are reusable milk, soft-drink and beer bottles (not all of them) and plastic orange-juice and similar flagbns sold door-to-door.

We hope this information will assist your research project.

Yours faithfully,



D. R. LEECE,
for Secretary

CONSERVATION COMMISSION of the NORTHERN TERRITORY



NORTHERN REGION OFFICE, STUART HIGHWAY, BERRIMAH, DARWIN, N.T.
P.O. BOX 38496, WINNELLIE 5789, AUSTRALIA
TELEPHONE: (089) 22 0211; VOCADEX: (089) 22 0376; TELEX: PARKS AA85336

OUR REF. 83/67

YOUR REF.

2 June 1983

Mr. David Clouser,
Hobart Study Centre,
Tasmanian College of Advanced
Education,
P.O. Box 1415P,
HOBART TAS. 7001

Dear Sir,


I refer to your letter concerning recycling projects and enclose copies of three completed information sheets as per your guide.

The three projects i.e. glass, aluminium cans and steel cans were developed largely as an attempt to remove the various items from the litter stream. Whilst there is evidence of success in this area there has also been some value in the exercise from a conservation viewpoint (aluminium cans), savings in refuse disposal (aluminium and steel cans), valuable disposal procedures (steel cans) and some possible health savings (glass).

Unfortunately the geographic position of the Territory in relation to major markets, coupled with a small and fairly dispersed local population precludes the economic recycling of materials.

It is hoped that the information supplied will prove of value.

Yours faithfully,


RON NOBBS
for Director

AUSTRALIAN ENVIRONMENT COUNCIL

IN REPLY
PLEASE QUOTE:

SECRETARIAT:
P.O. BOX 1252
CANBERRA CITY A.C.T. 2601
Telephone 467243

Mr David L. Clouser
School of Environmental Design
Tasmanian College of Advanced Education
P.O. Box 1214
LAUNCESTON TAS. 7250

- 8 APR 1983

Dear Mr Clouser

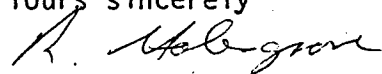
I refer to your letter of 18 March 1983, addressed to the Director, National Conservation Strategy Task Force, seeking information on solid waste management in Australia.

You will be aware that solid waste management is a responsibility of State/Territory and Local Governments and I would suggest that you write in the first instance to the agencies in each State and Territory with prime responsibility for waste management. A list of these agencies is attached.

The Australian Environment Council (AEC), which consists of the Commonwealth, State and Territory Ministers with prime responsibility for the environment, has an ongoing interest in both litter control and waste management and I have attached for your information a copy of 'Report on Litter Control' prepared by the AEC Litter Control Committee.

The comprehensive list of projects you are preparing would be of interest to the AEC and it would be appreciated if you could send me a copy in due course.

Yours sincerely



R. Holesgrove
Secretary to Council

APPENDIX C



COUNCIL HOUSE
27-29 ST GEORGE'S TERRACE,
PERTH, WESTERN AUSTRALIA.
GPO Box C120 PERTH. 6001
TELEPHONE 323 0311

City of Perth

PLEASE ADDRESS LETTERS TO THE TOWN CLERK

ENQUIRIES TO,

Mrs McFarling

YOUR REF.

OUR REF. EMcF:JG

28 September 1981

Mr D L Clouser
Project Leader
Tasmanian College of Advanced
Education
P O Box 1214
LAUNCESTON TAS 7250

Dear Mr Clouser

Thank you for your letter of September 18, 1981, relating to this Council's pilot study on separation at source for recycling of domestic rubbish.

Please find enclosed a copy of the brochure which was delivered door-to-door by a group of environmental health students from the Western Australian Institute of Technology. The students had been well briefed on the aims and objectives of the pilot study and were able to discuss the programme with the householders.

At the same time they distributed a questionnaire (copy enclosed) which was collected by Council officers a week later in conjunction with the distribution of the special containers mentioned in the brochure.

The project received an appreciable amount of publicity from all sections of the media. Perusal of the two News Releases enclosed will provide some of the information you are seeking regarding methodology and progress to date.

The choice of the area for the pilot study was based largely on the "mix" of residents --- flat dwellers, elderly, families --- and it was known that people in the Carlisle area are community-minded.

As to why source separation was selected in favour of some centralised scheme, it is my strong belief that eventually it will be possible to put the organic material in household rubbish through a pulverising process to turn it into a soil conditioner. Such a process is complicated by contaminants such as metal and glass --- items which, when separated, can be sold by the Council for recycling, representing a further cost saving.

In addition, Perth is only one of the local government authorities in the metropolitan area and there is no overall waste authority. Landfill is the disposal method common to all but as the urban areas expand, sites for this method are further and further out with the consequent rise in labour and transport costs. The Perth City Council is currently transporting refuse to a baling plant at Balcatta where the charge is \$18.00 per tonne for baling, a charge that inevitably will increase with time.

My philosophy is that in the Eighties there has to be a better way. Refuse is a resource, not rubbish, and it is up to the City of Perth, as the capital city, to show the way. It should not participate in any waste management programme that promotes pollution and if as a result of the pilot study we are able to extend the scheme throughout the municipality, we will be re-using the household refuse of some 36,000 residents instead of putting it in a hole in the ground.

I trust these comments and the enclosed documents will be of interest and I thank you for your good wishes. I return them for the Tasmanian project and would be most appreciative of a progress report when appropriate.

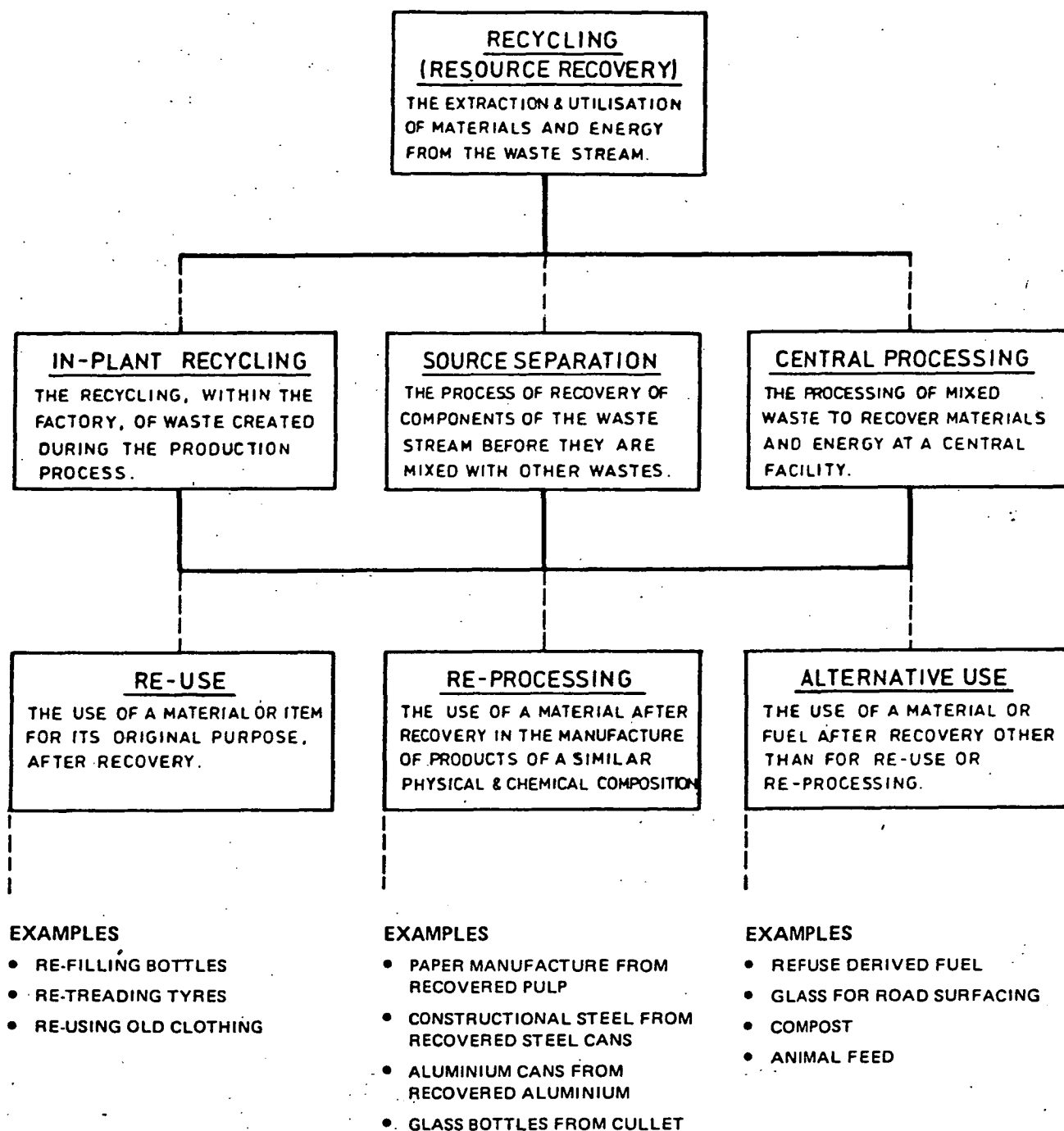
Yours sincerely



G O EDWARDS
TOWN CLERK

Encl.

RESOURCE RECOVERY- DEFINITION OF TERMS



Metropolitan Waste Disposal Authority
Sydney, New South Wales,
Australia